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ELECTRICAL REVIEW.

VOL. XI. DECEMBER 9, 1882. No. CCLXIII.

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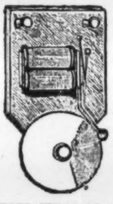

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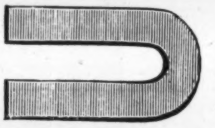

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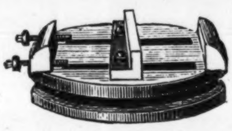

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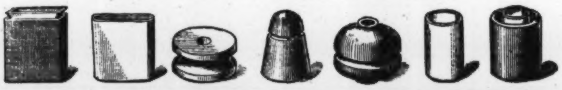

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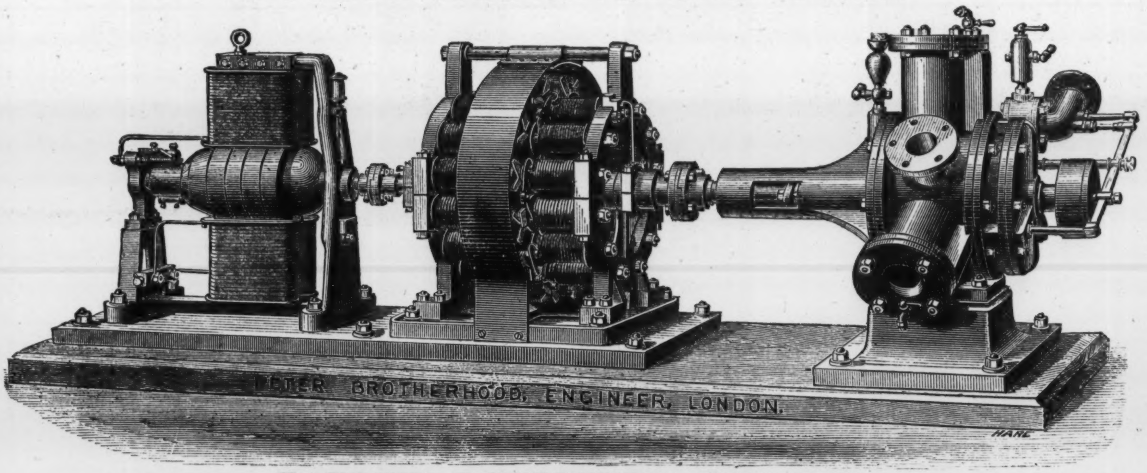

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THE TELEGRAPHIC JOURNAL AND
Electrical Review.
Vol. XI.—No. 263.

THE "FERRANTI" DYNAMO-ELECTRIC MACHINE.

Since writing our description of the "Ferranti" machine, which appeared in our last issue, we have been favoured by Mr. F. C. Phillips, the managing electrician of the Hammond Electric Light Company, with a short table of data giving the conditions under which the machine was working on the occasion of the public exhibition. It will be seen that but little difference exists between these figures and those we gave in our former article, and that the doubts we then expressed as to the correctness of the data given will apply with equal force to the table so kindly sent to us by Mr. Phillips, which is as follows:—

Current in main circuit	156 ampères
,, ,, each lamp	1·3 ,,
Resistance of armature	·0265 ohms
,, ,, external circuit	·7735
Total ,, ,, armature circuit	·8
E. M. F. total...	125 volts
,, for each lamp	41 ,,
Resistance of field magnets	2·5 ohms
,, ,, exciting machine	·5 ,,
,, ,, ,, circuit	3 ,,
Current in exciting circuit	22·5 ampères.

As we mentioned last week the indicated horse-power of the steam-engine when driving the machine to produce the necessary current for 300 Swan lamps of 20(?) candle-power each was 25·5. In a pamphlet which was circulated on the evening in question and descriptive of the system, the horse-power was stated to be *under* 26, and labelled on the walls it was given as 27. We will take as an approximate average 26 indicated horse-power. Whatever may be the candle-power of a lamp when a current of 1·3 ampères is passing through it, and a difference of potential of 41 volts exists between its terminals, each lamp will absorb ·0714 of an electrical horse-power, and therefore 14 such lamps may be obtained per electrical horse-power. 320 lamps of this kind could then be sustained at a certain luminosity by the consumption of 23 electrical horse-power. To produce such a result, however, it must not be forgotten that every one of the 320 lamps must be identical one with the other.

We have calculated, of course, on the basis of a single lamp, and we will now consider the figures given by Mr. Phillips in a somewhat wider sense. The calculated resistance of each lamp of the type given above and under those conditions is 31·5 ohms, and three in series would, therefore, amount to 94·5 ohms. If we take the average difference of potential between the terminals of each set of lamps as 123 volts, so as to allow for any slight loss of potential by reason of the distance of the lamps from the terminals of the machine, or the resistance of the conductor, we get through each branch a current of 1·3 ampères. We also find from the table that calculation gives about 160 ampères as the total current, but according to our reckoning the external resistance—leaving the main conductors out of the question amounts to, say, ·9 of an ohm, and not ·7735 as given. From this we find that the current amounts only to 140 ampères, and we venture to say that were the resistance of the external circuit properly measured, it would come out considerably above one ohm when one takes into account the number of connections made from lamp to lamp and between the conductors, some of which may not be perfect.

According to Mr. Phillips' table we obtain from the total electromotive force and ampères combined, an expenditure of over 26 electrical horse-power, but with our modified figures we cannot arrive at more than 23, whether by calculating on the basis of a single lamp or from the calculated external resistance of all the lamps. If, however, we could measure this external resistance, we should doubtless find the electrical horse-power still further reduced. Another point has yet to be considered. The engineer-in-charge of the Ferranti installation, Mr. Logan, informed us that the engine when driving the countershafting and the machines with *open circuits* indicated *about* 7 horse-power. From this it will be obvious that the amount of engine-power taken up in *producing* the current for the 320 Swan lamps would be considerably *lower* than the electrical horse-power quoted, were the figures for obtaining the latter result to be depended upon. We should imagine that no tests of anything approaching an accurate nature had been taken from the "Ferranti" machine—the fact of its being an alternating current system would not of course tend to make such tests of an easier character—and it would appear that its presumed efficiency has been simply calculated from the known data of a Swan lamp absorbing a certain current strength and at a stated candle-power. It will be well remembered by our readers that Mr. Gordon, in calculating the efficiency of his machine, *assumed* that each of his 1,300 lamps was absorbing 1-10th of an electrical horse-power and giving each a 20 candle-power light, when, as a matter of fact, some of the lamps were not alight and others were glowing with a luminosity of 5 or 6 candles. We do not expect the "Ferranti" machine to give but little, if any, greater result per horse-power expended upon it than machines of the Edison, Gramme, Siemens', &c., type, although the relation of its armature resistance to the external resistance is remarkable; but it possesses the great merit of simplicity, and therefore it can compete on very favourable terms, as regards cost of construction, with any machine with which we are acquainted. We may add that the favourable opinion we have already expressed upon the "Ferranti" system is in no way lessened by the slight analysis we have given of the supposed data of the machine, our sole endeavour now, and last week, being to show those responsible for its introduction how important it is to give figures the accuracy of which cannot be challenged, or to leave electricians to form their own estimate of the true worth of the invention.

Electroliers for the Electric Light.—On Wednesday evening we paid a hurried visit to the works of Messrs. Verity and Sons, of King Street, Covent Garden, the well-known artificers in ornamental brasswork. The firm also acts as agent for the Edison system of Electric Lighting, and on the evening in question the members of the Board of Trade representing the Strand district were present to examine the system, which was explained by Dr. Fleming, Electrician to the Edison Electric Light Company. A 60-light (nominal) dynamo-electric machine was keeping in operation 75 lamps. Next week we hope to do justice to the exquisite display of electroliers manufactured by Messrs. Verity & Sons, by far the most complete and extensive we have yet seen.

THE ROYAL SOCIETY.

On Thursday, the 30th ult., the president of the society, William Spottiswoode, Esq., D.C.L., LL.D., delivered his address at the anniversary meeting. We reprint those portions which we think will be of special interest to our readers, and refer briefly to some matters which are not connected with the electrical profession.

Mr. Spottiswoode commenced his address by alluding to the deaths of Darwin, Balfour, Sir Wyville Thomson, and others less known to fame, and after reference to the society's general arrangements, and a comparison of the number of papers received during the years 1873—1882, went on to say :—

Among the papers of this year, I may notice the elaborate research by Dr. Debus on "The Chemical Theory of Gunpowder," forming the Bakerian lecture ; the careful and long-continued investigations by Professors Liveing and Dewar on the spectra of water, and of carbon, and of mixed vapours.

Nor must I omit mention of Dr. C. W. Siemens' bold and original theory of the conservation of solar energy, which has already given rise to so much discussion. It will be sufficient for me here to say that upon the questions therein raised the last word has been by no means said ; and that, whether the theory be ultimately established, or whether, like a phœnix, it shall hereafter give rise to some other outcome from its own ashes, it will ever be remembered as having set many active minds at work, and will always have a place in the history of solar physics. . . . .

A most important change in the relations between the society and the Government in respect of State aid to science has been made this year. It will be in the recollection of the Fellows that an experiment was made for a period of five years, during which the sum of £4,000 was annually voted to the Science and Art Department, to be distributed at the recommendation of the Government Fund Committee of the Royal Society. That experimental period terminated, as then mentioned in my address, last year. The grant to the Science and Art Department has been discontinued, and in place of it an addition of £3,000 per annum has been made to the Government grant, making £4,000 in all. In concluding this arrangement the following stipulations were agreed to. The increased grant is to be administered by a committee identical with the late Government Fund Committee ; a portion may be devoted to personal grants, subject, however, to special recommendations to the Treasury ; and, lastly, unexpended balances may be carried forward from year to year, as has hitherto been the case with the old Government grant only. To the stipulation that the increased fund should be administered by the more extended committee the society felt that no reasonable objection could be offered, because upon it the President and Council are represented in full, and the *ex officio* members are, in the majority of cases, Fellows of the society. The object of the second stipulation was, so far as the society is concerned, to secure at the outset for the personal grants the consent and support of the Treasury, and thereby to preclude the chance of objection being subsequently taken to any of our proposals under this head. The President and Council, however, recognising the importance of great caution in respect of personal grants, have of their own motion appointed a special sub-committee (in addition to the three previously existing), to which all personal applications recommended by any of the other sub-committees are specially referred, and without whose recommendation none can come before the general committee. To the third mentioned point, viz., the power of retaining unexpended balances, the President and Council attach great value, because that power may enable the committee to devote more of its funds than heretofore to some of the larger undertakings in scientific inquiry, leaving more of the smaller grants to the special funds already in existence in the hands of the Royal and other societies. The meetings of this committee will probably take place twice a year, in May and November. In the present year it will not be possible to hold the second meeting before December, but there will be advantages in holding it hereafter in November, as the entire annual grants will then be made by the same committee and under the sanction of the same President and Council. In concluding these few remarks on the new arrangements, I cannot refrain from expressing my sense of the obligation under which the society and science at large are laid by the sympathetic and intelligent attention bestowed upon the subject by the then Financial Secretary of the Treasury, the late Lord Frederick Cavendish.

Among other subjects referred to the Royal Society by Public Departments I may mention a request from the Board of Trade for advice upon the question of improving the existing means at the Standard Office for the purpose of comparisons. At the request of the President and Council, Sir George Airy, Colonel A. Ross Clarke, and Professor Stokes acted as a Committee and drew up a very careful report, the value of which was fully recognised by the Board of Trade. The report suggested certain improvements in the present arrangements : but, having reference to the duties of the Standard Office as defined by Act of Parliament, it was not considered necessary to insist upon extreme scientific accuracy, such, *e.g.*, as that attained by Colonel Clarke himself in his "Comparison of Standards" made at the Ordnance Survey Office at Southampton in 1866.

The arrangements for the observation of the Transit of Venus have been steadily progressing. The parties have now all started for their stations, after their period of training under the superintendence of Mr. Stone at Oxford. An adequate supply of instruments has been secured at moderate cost, and all the accessory parts have been procured and applied by the indefatigable care and forethought of our directing astronomer.

The English expeditions for the observation of the approaching Transit of Venus are organised as follows :—

Accelerated Ingress.

Madagascar Observers.—Rev. S. J. Perry.
Rev. W. Sidgreaves.
Mr. Carlisle.

Cape Observatory Observers.—Mr. Gill and staff.

Aberdeen Road Observers.—Mr. Finlay, First Assistant of the Cape Observatory.
Mr. Pett, Third Assistant of the Cape Observatory.

Montagu Road Observers.—Mr. A. Marth.
Mr. C. M. Stevens.

Retarded Ingress.

Bermuda Observers.—Mr. J. Plummer.
Lieut. Neate, R.N.
Capt. Washington, R.E.

Jamaica Observers.—Dr. Copeland.
Capt. Mackinlay, R.A.
Mr. Maxwell Hall.

Barbadoes Observers.—Mr. C. G. Talmage.
Lieut. Thomson, R.A.

Besides the observers at these stations, the Canadian Government has arranged to place three 6-in. and some smaller telescopes in the field. Lieut. Gordon of Toronto was sent by the Canadian Government to England to make himself master of the proposed arrangements, and to secure the necessary instrumental equipment.

Accelerated Egress.

The stations for Retarded Ingress are also available for Accelerated Egress.

Retarded Egress.

Brisbane Observers.—Capt. W. G. Morris, R.E.
Lieut. H. Darwin, R.E.
Mr. Peek.

New Zealand Observers.—Lieut.-Col. Tupman, R.M.A.
Lieut. Coke, R.N.

Besides these observers sent specially from England, the observatories at Melbourne and Sydney are most favourably situated for observing the egress. The directors of these observatories, Mr. Ellery and Mr. Russell, have promised their co-operation, and their Governments have placed funds at their disposal to cover any necessary expenses.

Unless unfavourable weather should prevent the transit being seen at some of the stations, we may expect some nine or ten pairs of corresponding observations, both at ingress and egress, from the British expeditions alone. These observations are certain to be largely supplemented by those made by the observers of other nations ; and it is hoped, from the close agreement between the instructions issued to the different observers, that the whole may ultimately be available for combination in one general discussion.

The American astronomers, encouraged by the partial success which attended the plan they adopted in 1874, are relying chiefly upon the photographic method ; they have sent expeditions to South America and the Cape of Good Hope.

Austria does not take any active part in observing the transit.

France sends out eight well equipped expeditions, full particulars of which have been published in the *Comptes Rendus* for October 2nd.

From Holland no special expedition will be sent out, but Lieut. Heyming, of the Dutch Navy, will observe the transit in the West Indies, probably at Curaçoa.

Italy will confine its operations to observatories in that country.

Russia, also, has decided to send out no expeditions of its own, but it has aided the efforts of other countries by lending a 6·5 in. reflector to the Danish Government, and has placed two excellent 4·3 in. heliometers in the hands of the French astronomers, MM. Tisserand and Perrotin. The considerations which led the Russian Government to this conclusion have been explained in the following paragraphs of a letter from Mr. Struve to myself :—

"Experience since 1874 has sufficiently proved that there is no prospect whatever, even with combined international efforts, of obtaining by the present transit a geometrical determination of the parallax of the sun, which would not soon be surpassed in accuracy by other recent methods (for example, that suggested by Mr. Gill), methods which are capable of being repeatedly employed, and that without any costly expeditions.

"Further, although it must be admitted that so rare an opportunity of studying the atmosphere of the planet ought not to be neglected, yet it seems certain that so many and such excellent data will be obtained through the agency of the United States, as well as by other countries having well-provided observatories in the southern hemisphere, as well as by other seafaring nations." Under these circumstances Russia has not considered it incumbent on itself to organise any observing parties.

Spain has sent two parties of naval officers, well equipped with 6-inch equatoreals and other instruments, to the Havana and Porto Rico. . . . . .

The subject of the Circumpolar Observations mentioned in my address of last year, was since that time brought more formally before our Government by that of Russia. At the request of the Treasury, the President and Council, after consultation with the Meteorological Office, advised as follows :—

"The object of the undertaking is to throw light on the influence of the great inaccessible region surrounding the pole on the meteorology and magnetism of the earth. With this view it is proposed to take simultaneous observations at a chain of circumpolar stations for a full year at least.

"A chain of not less than eight stations will be occupied independently of any co-operation by this country. This chain, however, leaves a gap of 90° in longitude in the northern part of America, the centre of which would be advantageously occupied by a station in the Dominion of Canada. The value of the results will be greatly enhanced by the addition of this link to the chain. Independently of this, such a station would be of great value as being of a continental character, in contrast with the other stations, which are in close proximity to the coast. By choosing for the station one of the forts of the Hudson's Bay Company, no great outlay need be involved in its occupation."

The point first proposed was Fort Good Hope, near the mouth of the Mackenzie River; but it was found too late to erect the necessary huts and to transport the party and its provisions there during the present season. Fort Simpson, on the same river, was next suggested. Guided by considerations of facilities of access and sustentation, the committee came to the conclusion that either Fort Rae or Fort Providence, on Great Slave Lake, is to be preferred to Fort Simpson, with which the former forts nearly agree in latitude; and accordingly the President and Council recommended one of these.

"In framing an estimate, it was thought well to assume that the expedition might last a year and eight months, so as to allow a sufficient margin for travelling to and from the station, and for possible detention in waiting for the Hudson's Bay Company's brigade. It is calculated that the cost might be safely estimated at £3,000, which would include salaries of one officer and three men; journey of the party from England and back, including reasonable baggage, rations, allowances, and all other expenses."

To this communication the following reply was received:—

"My Lords have to thank you, and the Committee whom the Council appointed to advise them in the matter, for the valuable information contained in Dr. Michael Foster's letter of the 16th ultimo. Acting upon that information and upon the advice of the Royal Society, Her Majesty's Government have decided that this is an object on which public money may properly be employed, and they are prepared to ask Parliament to provide a total sum not exceeding £2,500 for the purpose. My Lords understand that there is good reason to hope that the balance required to make up the total estimated cost of £3,000 will be forthcoming from other sources.

"I am to ask whether the Royal Society would be so good as to take charge of the Expedition under similar conditions to those under which the Transit of Venus Expedition is being conducted; accounts of the expenditure chargeable to the Parliamentary grant being rendered to this Department. The choice of stations, the appointment of observers, and the methods of procedure would be left entirely to the society, subject to the condition that the total amount chargeable on public funds does not exceed £2,500. My Lords understand that it is expected that not more than £1,500 of this amount would come in course of payment during the present year, and they will present estimates to Parliament for £1,500 and £1,000 at the proper times."

The Canadian Government has since promised a contribution of 4,000 dollars towards the expenses of the expedition.

A committee, consisting of the President, Dr. Rae, Sir George Richards, Mr. R. H. Scott, and Professor Stokes, was accordingly appointed to superintend the expedition, which, comprising Captain H. P. Dawson, R.A., in command, Serjeants J. English, and F. Cookesley as observers, and W. Wedenby, as artificer, left England on May 11th, for Quebec, was heard of at Fort Carlton on 27th June, and was about to proceed the next day for Green Lake, on the way to Portage La Loche. It was still not quite certain whether it might not be necessary to push on to Fort Simpson, on account of insufficient accommodation, as well as lack of time and materials for building at Fort Rae.

Two parts of "Mittheilungen der Internationalen Polar Commission" have been published, containing full particulars and instructions relating to the whole circumpolar scheme. . . . . .

(*To be continued.*)

ON THE INFLUENCE OF TIME ON THE CHANGE IN THE RESISTANCE OF THE CARBON DISC OF EDISON'S TASIMETER.

By T. C. MENDENHALL, Columbus, O.

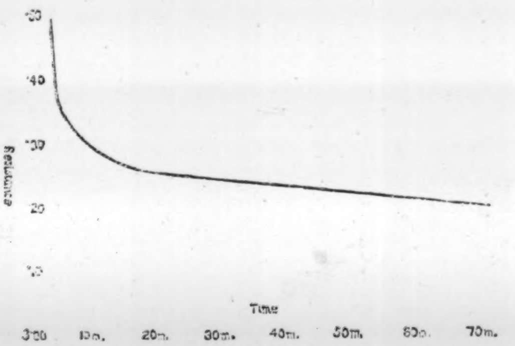
About five years ago Edison announced the discovery of the remarkable property possessed by carbon when prepared in a special manner, in virtue of which its electrical resistance was greatly lessened by subjecting it to an increase of pressure. Among the numerous interesting applications of this discovery which were quickly made, none was more promising or more interesting than the tasimeter devised by Edison himself. The extreme sensitiveness of the carbon to the slightest changes in pressure gave rise to the hope that the instrument would far exceed in delicacy those previously in use for the detection of minute quantities of heat.

Mr. Edison was a member of the Draper Eclipse Expedition in the summer of 1878, and used his tasimeter during the total eclipse of July 29th in that year, attempting to measure the heat emitted by the sun's corona. His report to the director, Dr. Henry Draper, was published in the Proceedings of the American Association for the Advancement of Science for the same year. This report shows that the attempt was by no means as successful as could have been desired, the principal obstacle being apparently the difficulty in the adjustment of the tasimeter so that the galvanometer needle would remain at zero, and to secure its return to that point after it had been deflected. In fact, the zero adjustment was only made by the use of a peculiar shunt of variable resistance ingeniously contrived by Mr. Edison for the purpose.

The writer is not aware of any other systematic attempt to secure quantitative results through its use, and, as far as known, the instrument has been generally regarded as peculiarly inconstant and unreliable in its indications.

Having in his possession a tasimeter constructed after the model of that described in the report referred to above, the writer undertook a short time ago to investigate the quantitative relation between pressure and resistance for the carbon disc which belonged to it. In a series of preliminary experiments, the use of the toothed wheel and screw, by means of which the pressure is communicated to the disc, was found to be extremely objectionable on account of the impossibility of exactly reproducing a given pressure. This portion of the instrument was, therefore, entirely removed, and an arrangement made by means of which any definite pressure might be quickly brought to bear upon the disc or removed from it. A slender brass rod was placed in a vertical position upon the centre of the upper contact piece, the upper end of which rested lightly in a small conical cavity made on the under side of the scale-pan of a balance. The weight was suspended above by a fine thread passing over a pulley, so that by raising or lowering it the pressure was applied or removed as was desired. The carbon disc was made one of the branches of a Wheatstone's bridge, as described by Mr. Edison. In lowering the weight care was taken to make the movement slow enough to avoid any shock to the disc. When the apparatus stood with the weight lifted, the adjustment of the galvanometer to the zero was made without any difficulty, the resistance of the disc appearing to be quite constant. When the pressure was applied, however, the adjustment became very troublesome, and after a few trials it was discovered that *time* was a very important element in the problem. The addition of a pressure of fifty grams reduced the resistance to nearly one-fourth of what it was in its normal condition *instantly*, but it was found that the minimum was not reached at once. The resistance continued to fall during the first two or three minutes with considerable rapidity, and after that more slowly. A series of experiments was accordingly undertaken for the investigation of this phenomenon. After a number of trials, the bridge was adjusted so that when the key was closed simultaneously with the application of the pressure the needle of the galvanometer would remain momentarily at zero, for the instantaneous effect of this pressure seemed to be quite constant. In a few seconds, however, the needle began to move, showing that the resistance was diminishing. With this constantly decreasing resistance it was, of course, difficult to obtain balances which were very accurate, but generally one could be obtained within a minute after the application of the pressure, and another a minute or two later, and so on. The operation was repeated many times, and a number of points for the curve shown below were obtained, which, though necessarily somewhat scattering, were so situated as to render its general form almost certain. In almost every instance immediately after the removal of the pressure, the normal resistance was again measured, and it was found that while time was necessary for the resistance to reach a minimum after the application of the pressure, the disc seemed to recover its maximum normal resistance instantly upon its removal.

After the construction of the curve showing the relation between time and resistance, and on the supposition that it correctly represents that relation, it was easy to know what the adjustment of the bridge should be at the end of any given time, and thus the difficulty of that adjustment disappeared. When tested in this way, the curve was found to be correct within the errors of experiment. The following table exhibits the resistances after various times, the *instantaneous* resistance being called 100. The resistance before the addition of the pressure of 50 grams was 11·67 ohms, which immediately fell to 3·52 ohms upon the application of the weight.



Curve showing the relation between Resistance and Time.

Time in minutes.	Resistance.	Time in minutes.	Resistance.
0	100	15	92·0
1	96·6	20	92·5
2	95·4	25	92·3
3	94·9	30	92·1
4	94·5	35	92·0
5	94·2	40	91·8
6	93·9	50	91·5
7	93·7	60	91·2
8	93·6	70	90·9
9	93·4	80	90·8
10	93·3	90	90·7
12	93·1		

It will be seen that the resistance falls a little more than 3 per cent. in one minute, about 5 per cent. in three minutes, and about 10 per cent. in one hour and a half, and it seems tolerably certain that even then a minimum is not reached. In two or three instances the time of continuous pressure was prolonged to twenty-four hours, the resistance at the end being slightly lower than at any previous reading. Finally, the apparatus was left with the weight applied for one week. No measurements were made during that time, but at the end the resistance was found to be decidedly lower than it was at the end of two hours after the application of the pressure, and it is especially to be noticed that on the removal of the pressure the normal resistance of a week before was instantly recovered. In this case the pressure applied was 100 grams. The resistance before the application of the pressure was 11·08 ohms. Upon applying the pressure it immediately fell to 2·34 ohms. In two hours this had been reduced to 2·10 ohms, and at the end of a week it was 1·93 ohms. Thus in two hours it was reduced by about 10 per cent., and after one week it was again about 10 per cent. lower.

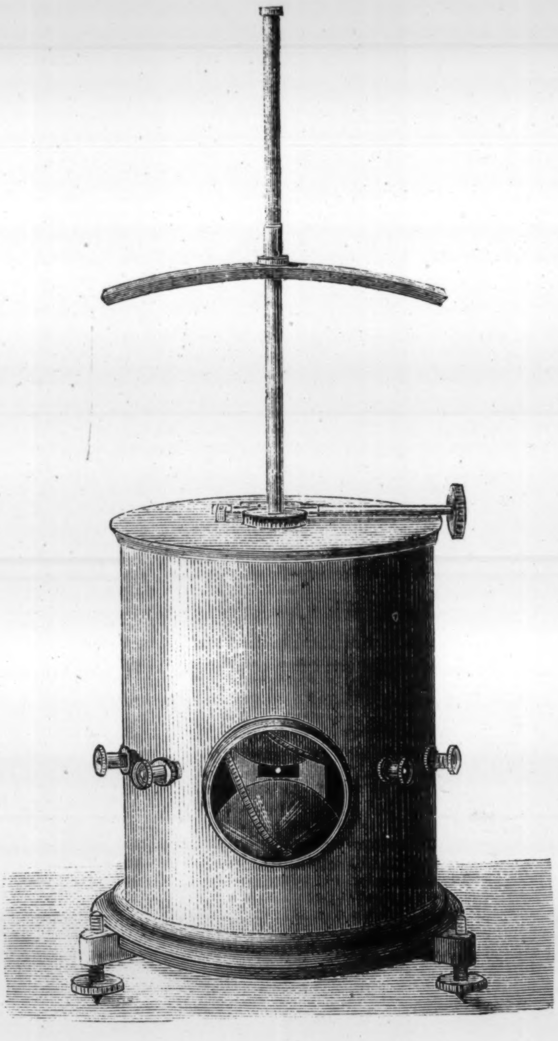
It appears, therefore, that the element of time plays an important part in the phenomena exhibited by the carbon disc, and it seems highly probable that this has been one of the principal causes, if not the chief cause, contributing to the inconstancy and unreliability of the indications of the tasimeter. The experiments made thus far indicate a fair degree of constancy in its results when this factor is considered. The writer hopes to be able to make further examination concerning the extent to which all of the conditions necessary to its use may be controlled.

The resistance of carbon under pressure has been made the subject of investigations recently by Mr. Herbert Tomlinson and Prof. Silvanus Thompson. The conclusion reached by both is that the diminution of resistance is really due to the contact between the electrodes, and it appears that Prof. W. F. Barrett has arrived at a similar conclusion, as a result of experiments made upon a "button of compressed lamp-black." Without knowing anything about the nature of these experiments, the writer desires to record his belief that this theory does not entirely account for the facts stated above. Besides, it seems a little difficult to understand how so small a pressure as 50 grams, added to an already existing pressure of about the same amount can increase the area of contact between a flat plate and a flat disc nearly four times, to say nothing of the "recovery," which takes place so promptly upon the removal of the pressure.—*The American Journal of Science*, Vol. XXIV., July, 1882.

AN IMPROVED THOMSON REFLECTING GALVANOMETER.

By F. J. MUDFORD.

In the ordinary reflecting galvanometer the most important portion of the coil, viz., that nearest the needles, is omitted, partly to make room for the emergence of the light from the mirror. In the above instrument (of which an illustration is given) I have placed the mirror between the coils, so that I am able to bring the coils almost exactly to the theoretical shape which gives the greatest sensitiveness, the only portion left out being that required for the motion of the needles, which, moving not only much closer to the wire than usual, but so near the metal frame that currents are induced in it which damp the swinging of the suspension.



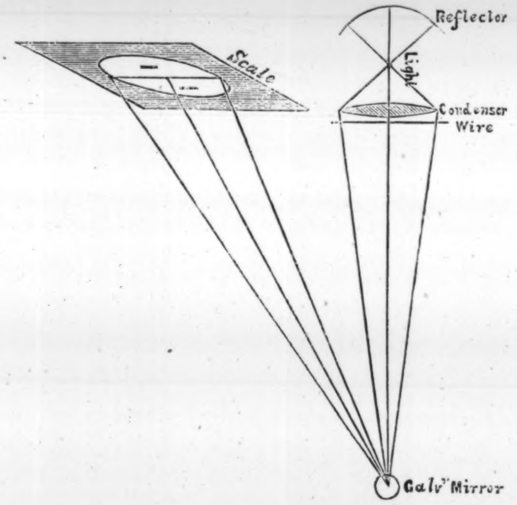
The suspension can be dropped into its place after the fibre has been made fast, without interfering with the coils.

The insulation of the instrument is far more perfect than in the ordinary form, 100 Leclanché cells producing no perceptible deflection when connected to one terminal. This is secured by mounting the terminals, which project through the case, on long insulating supports, which, being inside, where the air may be dried by means of sulphuric acid, are kept free from dust and films of moisture. When such very high insulation is required, the conical ebonite plugs which slide on the terminal rods are withdrawn (as in the engraving), leaving annular air spaces between the terminals and case.

The instrument is wound with a double set of coils, one of high and the other of low resistance, and is suitable for any purpose to which a sensitive reflecting galvanometer can be applied.

In the optical arrangement of the scale, the condenser has been placed between the object (the fine wire) and the light, certainly the correct place for it, as by placing the object behind the lens, a real image of the virtual, and therefore enlarged image of the wire, is produced upon the scale, a very undesirable result, as the image upon the scale should be as fine and distinct as possible, and not blurred by the interposition of a condenser.

Subjoined is a diagram of the arrangement :—



It will be seen by the above diagram that there is no object in having the image of the light at the galvanometer mirror larger than the mirror, as it is evident that the only part concerned in the brightness of the image upon the scale is what falls upon and is reflected from the surface of the mirror. I have accordingly supplied a lamp, giving a small but intrinsically brilliant flame.

The image of the wire upon the scale will be the same size as the wire itself, as they are both the same distance from the galvanometer mirror which produces the image. It will be found with nearly all scales that this is not so, but that the image of the wire is much thicker than the wire, and frequently blurred. It will thus be seen that the brightness of the image is not affected by alterations in the size of the condenser.

[We have had an opportunity of examining one of Mr. Mudford's galvanometers, constructed by Messrs. Paterson & Cooper, and quite consider that in many respects the instrument is a decided improvement on the existing forms. The addition of a thick wire coil, the high insulation, and the arrangement of the lens so as to obtain a sharp image on the scale, are very great and useful refinements, whilst the disposition of the needles, mirror, and suspending fibre, so that the latter can be easily got at, is an improvement which those who have had the misfortune to break the same would thoroughly appreciate. We cannot agree, however, with two points which are claimed as being of great utility. Mr. Mudford argues that by getting the wire wound very close to the magnetic needles he considerably increases the effect of the current on them. Now this would be true supposing that the magnitude of the coils was small compared with the size of the space within which the magnetic needles swing. The resultant effect of the current on the needles is, however, due to the sum of the effects produced by all the turns of wire ; and inasmuch as the major portion of these turns must in any case be distant from the needle, the *total* result of all the turns is but very little added to by the few extra turns set close to the needles. The fact of the movement of the needles being damped by the contiguity of the metal frame is a great disadvantage when discharge currents have to be measured, and such measurements are of constant occurrence in electrical testing.—EDS. ELEC. REV.]

REVIEWS.

The Watch and Clockmakers' Handbook. By F. J. BRITTEN
Fourth edition. London: W. Kent & Co., Paternoster Row, and Grimshaw and Baxter, 35, Goswell Road.

ALTHOUGH the major portion of the information contained in this small work is of comparatively little use except to watch and clockmakers, yet there is much which is of value to those interested in telegraph instrument construction. Most of the electro-mechanical work executed by amateurs bears very clear indications of its being carried out by those whose only training has been in engineering workshops. This arises, as we have before pointed out, from the fact that in colleges and schools where technical instruction is given, the latter is always (we believe there is no exception) of such a nature as only to enable those taught to manufacture or design comparatively heavy machinery. Watch and clockwork, it is perhaps unnecessary to say, is fashioned by tools which are quite unlike those required for ordinary engineering work. It is not at all an uncommon thing for an amateur who has turned his attention to telegraph instruments or clockwork, to wonder why he cannot make his pivots run smoothly and true by turning them in his lathe in the same way as he would the crank shaft of a model engine. He also wonders why it is that he cannot make his model A B C instrument work without its indicator continually lagging behind, or why he requires so much battery power to make it work at all. In fact the amateur can only recognise a steam-engine and a watch as both being machines generally, and being such he imagines that the pieces of each can be constructed by the same tools.

That electrical work is coming very much to the fore is certainly abundantly recognised by the fact that the general subject is taught at almost every school, and also of course at every college where an applied science department exists. We certainly think, however, that in the lectures given on workshop appliances some allusion at least should be made to the watch and clock branch of the subject, and also that in the workshop instruction the elements of clock and watch construction should be taught. The City and Guilds of London Institute is, we believe, the only place at which such instruction is given, and we may mention that the "Watch and Clockmakers' Handbook" is one of the works recommended for the course, a fact which in itself speaks well for the book.

While recognising the utility of Mr. Britten's work we regret that he has not mentioned one or two tools which are almost indispensable for ordinary electrical instrument work ; we find, for instance, no mention made of that most useful hand lathe the "clockmaker's throw." We are also somewhat surprised that the "uprighting" tool is not illustrated or referred to. The study of watch and clockwork is not only most useful, but also most fascinating. In clock mechanism, and especially in old clock mechanism, some most remarkable pieces of human ingenuity exist which are known to comparatively few. How many, for example, know the value of the "epicyclic train"? To those who are especially interested in ingenious pieces of mechanism we would recommend a study of the patents of Sir Charles Wheatstone. In one of these patents (we forget which) is described one of the prettiest pieces of mechanical ingenuity ever devised, but which, we believe, is almost entirely unknown ; we allude to the mechanism devised for enabling an A B C instrument with a large and heavy hand to be worked by the rapidly alternating currents of the Wheatstone A B C magneto transmitter.

A Treatise on the Transit Instrument as Applied to the Determination of Time. By LATIMER CLARK. Published by the Author, at 6, Westminster Chambers, London, S.W.

THE author states that "the motive of this little work is a desire to introduce the transit instrument into more common use for purposes of utility and amusement, and more especially as a means of obtaining true time for the regulation of clocks and watches." To the uninitiated the contents of the book must look somewhat alarming at first, and one would not be surprised if the amateur purchaser on glancing at it, at once threw it aside as being far too deep for his comprehension. Actually, however, the difficulties to be overcome will be found to be very slight indeed, and we quite think that a large amount of very profitable amusement may be obtained by the help of the volume and the instrument it describes. The fact of the work being brought out by Mr. Latimer Clark must recommend it to the telegraph profession generally.

[Besides the foregoing books, we have also received *The Law Relating to Electric Lighting; being the Electric Lighting Act*, by G. Spencer Bower, B.A., and Walter Webb (London: Sampson Low, Marston, Searle, and Rivington, 188, Fleet Street); *Electric Illumination*, Vol. I., by Conrad Cooke, James Dredge, F. O'Reilly, S. P. Thompson, and H. Vivarez, Edited by James Dredge, chiefly compiled from *Engineering* (Offices of *Engineering*, 35 and 36, Bedford Street, Covent Garden, London); and *Le Siphon-Recorder et la Curb-Sender*, monographie par A. L. Ternant (Paris: Librairie de l'Académie de Médecine, 120, Boulevard Saint-Germain); but owing to the extreme pressure on our columns, we have not yet been able to notice them.—Eds. Elec. Rev.]

REVISED EDITION OF PATENT RULES.

[We have received the following rules and regulations from Mr. H. Reader Lack, which we think of sufficient importance to publish.]

RULES, REGULATIONS, AND ORDERS FOR THE PASSING OF LETTERS PATENT FOR INVENTIONS.

By virtue of the provisions of the Patent Law Amendment Act, 1852, We, the Right Honourable Roundell Baron Selborne, Lord High Chancellor of Great Britain, the Right Honourable Sir George Jessel, Master of the Rolls, Sir Henry James, Her Majesty's Attorney-General, and Sir Farrer Herschell, Her Majesty's Solicitor-General, being four of the commissioners of patents for inventions under the above-mentioned Act, do hereby make the following rules and regulations:—

General Rules.

I. The office of the commissioners of patents shall be open to the public every week-day, Christmas Day and Good Friday excepted, from 10 to 4 o'clock.

II. All petitions for the grant of letters patent, declarations, and provisional specifications, shall be left at the office of the commissioners; all specifications in pursuance of the conditions of letters patent, and all complete specifications accompanying petitions for the grant of letters patent, shall be filed at the office of the commissioners.

III. Specifications, copies of specifications, provisional specifications, petitions, notices, and other documents must be written or printed in large and legible characters; and the signatures of the petitioners or agents thereto must be written in a large and legible hand.

IV. Stamp duties payable upon notices to proceed, notices of objection, or warrants and letters patent will not be received in the office of the commissioners after 2 o'clock in the afternoon of Saturdays, nor after 3 o'clock on other days: except that on the last day for the payment of any of such stamp duties they will be received up to 4 o'clock.

Application with Provisional Specification.

V. In every application for letters patent, the title of invention and the provisional specification must be limited to one invention only; and no provisional protection will be allowed or granted where the title or the provisional specification embraces more than one invention.

VI. The title of the invention must point out distinctly and specifically the nature and object of the invention.

VII. In every application for letters patent for an invention which is not the discovery of the applicant, the petition and the declaration must state the source of the invention in one of the forms given at page 11,* or in a form as near thereto as circumstances will admit.

VIII. No amendment or alteration, at the instance of the applicant, can be made in a provisional specification after provisional protection has been allowed, except for the correction of clerical errors or of omissions or errors made *per incuriam*. Application for leave to amend a provisional specification or other document must be made to the law officer to whom the petition for letters patent has been referred.

IX. The provisional specification must state distinctly and intelligibly the whole nature of the invention, so that the law officer may be apprised of the improvement, and of the means by which it is to be carried into effect.

X. Every provisional protection of an invention allowed by the law officer shall be forthwith advertised in the *Commissioners of Patents' Journal*; and the advertisement shall set forth the name and address of the applicant, the title of his invention, and the date of the application.

XI. Where an applicant for letters patent, after obtaining provisional protection, shall give notice in writing at the office of the Commissioners of his intention to proceed with his application for letters patent, the same shall forthwith be advertised in the *Commissioners of Patents' Journal*; and the advertisement shall set forth the name and address of the applicant and the title of his invention, and that any persons having an interest in opposing such application are to be at liberty to leave particulars in writing of their objections to the said application at the office of the commissioners, within twenty-one days after the date of the Journal in which such notice is advertised.

XII. The notice of the applicant of his intention to proceed for letters patent must be left at the office of the commissioners within four calendar months from and after the date of application; and the application for the warrant of the law officer and for the letters patent must be made at the office of the commissioners twenty-one days at the least before the expiration of six calendar months from and after the date of application: Provided always, that when the last day for giving such notice or making such application falls on Sunday, Good Friday, or Christmas Day, such notice may be given or application made on the following day: Provided also, that the Lord Chancellor may in either of the above cases, upon special circumstances, allow a further extension of time, on being satisfied that the same has become necessary by accident, and not from the neglect or wilful default of the applicant or his agent.

Directions as to *Sizes* and *Methods of Preparing* Petitions, Declarations, Provisional Specifications, Drawings to accompany Provisional Specifications, and Copies thereof.

XIII. All petitions for the grant of letters patent, all declarations, and all provisional specifications, shall be respectively written or printed upon sheets of paper of twelve inches in length by eight inches and a half in breadth (but on one side only), leaving a margin of one inch and a half on every side of each page.

XIV. The drawings accompanying provisional specifications shall be made upon a sheet or sheets of parchment, drawing paper, or cloth, each of the size of twelve inches in length by eight inches and a half in breadth, or twelve inches in breadth by seventeen inches in length (but on one side only), leaving a margin of one inch on every side of each sheet.

XV. The copy of the provisional specification, to be left at the office of the commissioners with the provisional specification, shall be written or printed upon sheets of brief or foolscap paper, briefwise, and upon one side only of each sheet.

XVI. The copy of the drawing or drawings, to be left with the copy of the provisional specification, must be made upon good white smooth-surfaced drawing paper of the same dimensions as the original drawing. All the lines must be absolutely black, Indian ink of the best quality to be used, and the same strength or colour of the ink maintained throughout the drawing. Any shading must be in lines, clearly and distinctly drawn, and as open as is consistent with the required effect. Section lines should not be too closely drawn. No colour must be used for any purpose upon this drawing. All letters and figures of reference must be bold and distinct. The border line should be one fine line only. The drawing must not be folded, but must be delivered at the office of the commissioners either in a perfectly flat state or rolled upon a roller, so as to be free from creases or breaks.

XVII. In all cases where the original drawing is coloured, there must be left, in addition to the above copy, another copy coloured.

Directions as to *Sizes* and *Methods of Preparing* Specifications in pursuance of the conditions of Letters Patent, Drawings to accompany the same, and Copies thereof.

XVIII. All specifications in pursuance of the conditions of letters patent, shall be respectively written or printed bookwise upon a sheet or sheets of parchment, each of the size of twenty-one inches and a half in length by fourteen inches and three-fourths in breadth; the same may be written or printed upon both sides of the sheet, but a margin must be left of one inch and a half on every side of each page.

XIX. The drawings accompanying such specifications shall be made upon a sheet or sheets of parchment, each of the size of twenty-one inches and a half in length by fourteen inches and three-fourths in breadth, or twenty-one inches and a half in breadth by twenty-nine inches and a half in length (but on one side only), leaving a margin of one inch and a half on every side of each sheet.

XX. The copy of the specification, to be left at the office of the commissioners on filing the specification, shall be written or printed upon sheets of brief or foolscap paper, briefwise, and upon one side only of each sheet.

XXI. The copy of the drawing or drawings, to be left with the copy of the specification, must be made on good white smooth-surfaced drawing paper of the same dimensions as the parchment drawing. All the lines must be absolutely black, Indian ink of the best quality to be used, and the same strength or colour of the ink maintained throughout the drawing. Any shading must be in lines, clearly and distinctly drawn, and as open as is consistent with the required effect. Section lines should not be too closely drawn. No colour must be used for any purpose upon this drawing. All letters and figures of reference must be bold and distinct. The border line should be one fine line only. The drawing must not be folded, but must be delivered at the office of the commissoners either in a perfectly flat state or rolled upon a roller, so as to be free from creases or breaks.[*]

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* In Pamphlet.

XXII. In all cases where the original drawing on parchment is coloured, there must be left, in addition to the above copy, another copy coloured.

Application with Complete Specification.

XXIII. Every application for letters patent, with complete specification, must be limited to one invention only; and no warrant will be granted where the title or the complete specification embraces more than one invention.

XXIV. The title of the invention must point out distinctly and specifically the nature and object of the invention.

XXV. In every application for letters patent for an invention which is not the discovery of the applicant, the petition and the declaration must state the source of the invention, in one of the forms given at page 11, or in a form as near thereto as circumstances will admit.

XXVI. Every invention protected by reason of the deposit of a complete specification shall be forthwith advertised in the *Commissioners of Patents' Journal;* and the advertisement shall set forth the name and address of the applicant, the title of the invention, the date of the application, and that a complete specification has been deposited.

XXVII. Where an applicant for letters patent, after deposit of a complete specification, shall give notice in writing at the office of the commissioners of his intention to proceed with his application for letters patent, the same shall forthwith be advertised in the *Commissioners of Patents' Journal;* and the advertisement shall set forth the name and address of the applicant and the title of his invention, and that any persons having an interest in opposing such application are to be at liberty to leave particulars in writing of their objections to the said application at the office of the commissioners, within twenty-one days after the date of the Journal in which such notice is advertised.

XXVIII. The notice of the applicant of his intention to proceed for letters patent must be left at the office of the commissioners within four calendar months from and after the date of application; and the application for the warrant of the law officer and for the letters patent must be made at the office of the commissioners twenty-one days at the least before the expiration of six calendar months from and after the date of application: provided always, that when the last day for giving such notice, or making such application, falls on Sunday, Good Friday, or Christmas Day, such notice may be given, or application made, on the following day: provided also that the Lord Chancellor may in either of the above cases, upon special circumstances, allow a further extension of time, on being satisfied that the same has become necessary by accident, and not from the neglect or wilful default of the applicant or his agent.

(*To be continued.*)

THE PATENT ELECTRIC GAS IGNITING COMPANY (LIMITED).

For some weeks past the investing public has been comparatively free from the natural embarrassment of deciding which of several competing electrical companies offering shares at the same time best deserves support.

As the period when this was the case has barely gone by, investors have no doubt a lively recollection of what they expected in return for their money, and they have now experienced for the most part the truth of the text, "Blessed is he who expects nothing," &c.

The above remarks will of course be understood to apply chiefly to electric light companies, and it is therefore somewhat of a relief to turn to anything proposed for the employment of electricity in other ways, even though it be a means for lighting gas.

The prospectus of the Patent Electric Gas Igniting Company is before us, and the company's object is primarily "to acquire as going concerns the undertakings and patents of the 'Electric Gas Lighting Company (Limited),' Manchester, and the 'London and Provincial Electric Gas Lighting Company (Limited),' London, and also to acquire the rights of the patentees in the portable batteries, improved induction coils, and machinery for producing the same. By this purchase the company will secure the exclusive right of manufacturing and selling Clarke's patent electric gas lighting apparatus and portable battery, induction coil, and coiling machine for *all parts of the world* where patents have been or may be obtained."

The advantages of lighting gas by means of electricity or, more properly speaking, by means of the electric spark, are set forth in the company's prospectus as follows:—

1st. It affords a complete safeguard against fires from the careless use of matches, paper, tapers, &c., for lighting gas; the destruction and soiling of table-cloths, carpets, furniture, billiard tables, &c., from droppings of grease and sparks, caused by igniting gas with matches, tapers, and the other appliances now in use.

2nd. It can be used without risk of explosion in all factories, as it will ignite gas only; it will not even ignite the explosive part of an ordinary match.

3rd. Its economy; owing to the lasting powers of the lighter.

4th. Its perfect adaptability also to the purposes of street lighting, as it can be used for that purpose in any wind and in any weather.

As we understand the apparatus from the drawings which accompany the prospectus, it appears to consist electrically of a small battery and an induction coil. These are apparently contained in a case of telescopic form from the end of which protrudes a tube or rod, having arranged at its end two points for a spark to jump between. On the case is a press-button, which we presume takes the place of the ordinary "make" and "break" arrangement of an induction coil. The instrument looks neat and is so far simple enough. We remember some years ago an attempt to introduce an electric "gas lighter," constructed on the principle of the "electrophorus." This was also exceedingly simple, but it was not always to be depended upon for certainty in its action. It was necessary to keep it quite dry, and it frequently failed completely for no apparent reason. When in good condition it was oftentimes a matter of difficulty even then to light the gas, for it was necessary that one should have attained considerable facility in its use to make sure of igniting the gas without many failures. If we are not mistaken, Messrs. Strode & Co., the "well-known gas and electric engineers"—to quote the words of the prospectus—who are so favourably impressed with the value of the present invention, that they concluded a contract with the London and Provincial Electric Gas Lighting Company to manufacture and sell the apparatus throughout the entire district of London and the South, and to meet all demands that might arise for the same; were prominently connected with the "Electrophorus" gas igniter of which we have just spoken.

Returning to the new company's project, we find that the terms of purchase, for the two businesses, the factory, patents, patent rights, goodwill, &c., and the rights of the patentees, have been fixed, as modified, at £75,000, payable as to £29,920 in cash, and as to £45,080 in shares, and this price includes all expenses of the formation of the company. The total capital of the company is £100,000, in 20,000 shares of £5 each, and this is the way in which it is expected great profits will be derived.

1st. In the manufacturing and selling, and the licensing of others to manufacture and sell the various forms of lighting apparatus, induction coils, coiling machines, portable batteries, and portable electric bells, in the United Kingdom of Great Britain and Ireland.

2nd. In the selling of patents or licences for foreign countries, the Colonies, and British Dependencies.

Patents have already been obtained for the United Kingdom, France, Belgium, Germany, Italy, Austria, and the United States of America, and it is proposed that these patents, together with those for which application has been made, or which may hereafter be obtained, should be from time to time disposed of by the company.

By these means alone it is confidently expected that an amount exceeding the whole of the capital will be returned to the shareholders, who will, in addition, continue to receive from the profits of the manufacture, dividends which, it is estimated, will be at a rate rarely reached by any joint stock company.

The first issue of shares will be 16,000. Of these 9,016 are taken, fully paid, by the vendors, in part payment for the properties, 5,839 have been already subscribed, leaving only 1,145, which are now offered for public subscription at par.

We would first of all call attention to the manner in which it is *confidently expected* that an amount exceeding the whole of the capital will be returned to the shareholders.

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[*] N.B.—The commissioners of patents having decided that the drawings accompanying the provisional, complete, and final specifications of 1876, and subsequent years, shall be copied by the process of photo-lithography, this regulation must be strictly observed, in order that correct copies may be made. Specifications and drawings filed in pursuance of letters patent should be left at the office of the commissioners at least six days before the expiration of the time for filing the same, in order that the officers may examine the extra copy of the drawing, and ascertain that it has been prepared in conformity with the rules.

Cannot any firm or private individual manufacture a "gas igniter," made up of a battery, induction coil, and any suitable arrangement for the sparks to fly across? We say, yes, decidedly; and therefore the matter resolves itself into one of using a special form of battery, or a special induction coil, and the question is simply then the worth of such patents. Of course a going concern, independently of patents, may be exceedingly valuable, but on the face of it we cannot see this factor in the double business about to be acquired by the company.

It is said that the apparatus is in extensive use in Manchester and district, but this does not prove much. It appears to us, rightly or wrongly, that when the figures we have given above concerning the issue of shares are analysed, the working capital to carry on this valuable business amounts to £5,000. Is this the amount which it is confidently expected will be exceeded? From the large proportion of the first issue of shares taken by the vendors and privately subscribed, one might almost fancy that vendors and purchasers are too closely allied.

We feel assured when looking at some of the names on the board of directors that everything has been proposed in good faith as far as the public is concerned, but we cannot look upon the undertaking as one which will eventually prove the correctness of the promoters' views. On the contrary, contrivances for gaslighting by electricity have been numerous enough, but we do not know of the permanent success of any. Therefore the price asked by the vendors for the resurrection of an old idea dressed up anew appears to be quite out of all proportion to its value, and although the shares now offered to the public amount to less than £6,000 in value, we are inclined to think that better ways might easily be found for investing such a sum even in the electrical world.

THE BRUSH COMPANIES AND THE LANE-FOX LAMP.

During the last few weeks the reports of the subsidiary Brush companies' meetings must have proved, to any one connected with the subject of electric lighting, very interesting.

To most of our readers it is probably by this time well known what effect the letter of Sir Charles Bright, contained in our issue of October 7th, has primarily had. Certain individuals, either from *bonâ fide* motives or from the desire to get back their money invested in the Brush subsidiary companies (the shares of which are in most instances quoted at a discount), or perhaps for the sake of making some immediate *profit*, filed petitions for the winding-up of the companies in which they respectively hold a few shares. With their motives we have at the moment nothing to do, but the expressed views of the Chairmen of those companies which have had meetings since, and in consequence of the appearance of the aforesaid letter, comprise much that is noteworthy and also (bearing in mind the social positions of some of the speakers) much that is surprising. If a company buys two things, each for, say, £50,000, and one of those two things is afterwards proved to have been bought through negligent or wilful misrepresentation on the part of the vendor, surely the vendor is liable for any direct or indirect loss the purchaser may have made through such negligent or wilful misrepresentation. It is poor consolation and quite beside the mark to say, as have some of the speakers at the recent shareholders' meetings, that the Lane-Fox patent is no longer of much value.

If this latter statement be true, and we see no reason to contradict it, what an enormous sum of money these infant "Brushes" must have squandered, for what else have they obtained for their money? The right to use the Brush dynamo and the Brush arc lamps! The former in danger from competition with newer fashioned machines, less costly to construct, and the latter one pattern of many, about equal in value so far as their practical utility is concerned. However, the question, which none of the boards of directors seem fairly to ask themselves is, what, in the interest of the shareholders, is it their duty to do? Mr. David Evans, who was a director of the Birmingham and Warwickshire Electric Light Company, was apparently the only man who properly recognised what his duty was. His speech, as reported on p. 424 of our issue of Nov. 25th, we recommend to some of those who presided over the various meetings, and who endeavoured, in a weak manner, to argue away the extent of the loss incurred through their negligence, or oversight, by trying to prove that the property so obtained was worth nothing. It may be to many very unpalatable, but we cannot insist too strongly that the Chairmen and directors of these subsidiary companies are the trustees of their shareholders' interests, and that any miserable patching up, or slurring over of the present crisis, will probably only delay, for a time, that reckoning with their shareholders which the Lane-Fox incident had almost precipitated.

At the meeting of the Brush Electric Light and Power Company of Scotland, reported in our last issue, a shareholder said he had heard "that one company had already obtained on account of the Lane-Fox blunder the sum of £21,000," which statement was met by cries of "No, no," and a director answered, "Not a penny." The director was right, it would appear, but to what extent was he right? Well, we have before us, at this moment, a circular issued by the directors (through their secretary) of one of the Brush companies, in which they distinctly say they unhesitatingly recommend its (the £21,000) acceptance. So the director was only correct thus far—the money was not then *actually paid;* we give however this circular, for it is of importance as showing the disposition of those responsible to the shareholders to get out of their difficulty in any way easiest to themselves. It may however be remarked that the easiest way is not always the most profitable to the shareholders. The italics in the circular are ours.

To the Shareholders of the Birmingham and Warwickshire Brush Electric Light and Power Company (Limited).

Dear Sir,—Consequent upon the resolutions passed without a single dissentient at the extraordinary general meeting of shareholders of this company, held on Wednesday last (a full report of which accompanies this circular), at which meeting upwards of 34,000 shares, out of a possible total of 38,000, were represented, either in person or by proxy, your directors have lost no time and spared no pains in endeavouring to bring to a successful issue the negotiations then pending with the vendors in reference to the Lane-Fox licence, and I now have great pleasure in stating that an offer has been made by them (the vendors) for the *re-purchase of the same* for the sum of £21,000, payable as to £4,000 in cash, and £17,000 in shares of the company.

This offer is, in the opinion of your directors, not only fair and reasonable, but even advantageous, and they unhesitatingly recommend its acceptance forthwith; but, as stated by your chairman at the meeting, your directors are most anxious that in any important step of this character which they may take, they should have the entire concurrence of the general body of their constituents, therefore, before closing with this offer (which they otherwise would do at once), they would be glad to have the expression of your views thereon, upon the accompanying form, and failing the receipt of any such expression by Wednesday next, the 29th instant, they will treat your *silence as a corroboration of their action.*

It may be pointed out that the maximum profit which would accrue to this company by retaining the Lane-Fox licences and attempting to introduce the Lane-Fox lamps would be a commission of 10 per cent. on the lamps sold. The price of the lamp is 5s.; it will therefore be seen at a glance that 840,000 lamps would have to be sold before the equivalent of £21,000 now offered could be realised by this company, exclusive of the attendant expenses, and the re-sale of the licences would also at the same time leave this company perfectly free to supply the best lamp which at any time might be in the market, on which it would, of course, also secure the trade discount.

I would also desire to point out that by the arrangement herein contemplated, your directors avoid on the one hand the necessity of plunging the company into a tedious and lengthy litigation with the vendors, the issue of which would be doubtful but the expense certain, and on the other the alternative of the inevitable winding-up of the concern, a course directly antagonistic to the unanimous wishes of an overwhelming majority of the shareholders, and one which, after the unanimity evinced at the extraordinary general meeting, need, the directors believe, be no longer seriously contemplated; and I am authorised to reiterate the statements made by your chairman, viz., that not one penny-piece has been or will be paid away in settling or compromising any of the vexatious actions which have been or may be brought against the company.

I am, dear Sir, yours faithfully,
H. W. ATKINS, Secretary.

110, Cannon Street, London, E.C.,
November 25th, 1882.

We have no disposition to object to the kind of offer referred to in the above circular, and provided a sufficient return of *cash* as well as shares is made (for it must be remembered that nearly all such shares are at present at a heavy discount), it might be advisable for the shareholders to accept such offers; but we do strongly object to seeing the Chairmen and directors trying to get out of their difficulty by recommending to their respective shareholders *anything* which may appear to be a present solution of the question at issue. In conclusion, we append a tabular statement, which at this time may be interesting, and also useful in aiding our readers to form an idea of the worth of the offers made to them.

Company.	Nominal Capital.	Shares.	Issued.	Calls paid.*	Considered as paid.	To Vendors.
	£	£	£	£ s.	£	£
Great Western Electric Light Co. ..	250,000	5	125,000	53,579	15,000	19,000 cash 15,000 shares
South Eastern Electric Light Co. ..	100,000	5	100,000	31,300		12,750 cash 2,000 shares
Brush Midland Electric Light Co. ..	250,000	5	125,000	31,450	18,000	22,750 cash 18,000 shares
Birmingham & Warwickshire Electric Light Co.	100,000	2	100,000	30,428 10	45,000	15,000 cash 25,000 shares
Staffordshire & Worcestershire Electric Light Co. ..	200,000	2	200,000			30,000 cash 32,000 shares
Yorkshire Brush Electric Light and Power Co.	300,000	2	200,000	122,943 10		37,500 cash 37,500 shares
Brush Electric Light Co. of Ireland ..	250,000	5	Seven shares only subscribed as per Articles of Association.			
Brush Electric Light and Power Co. of Scotland	300,000	5		55,000	20,000	15,000 cash 10,000 shares
Devon & Cornwall Electric Light and Power Co.	100,000	5	100,000	18,902		7,500 cash 7,500 shares

* Compiled from Official Returns made at Somerset House.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.

Letters, &c., for the "Correspondence" columns should arrive not later than Tuesday morning if they are desired to appear in the following number, such communications to be addressed to the "Editors," Electrical Review, 22, Paternoster Row, London, E.C.

Letters respecting Advertisements, Subscriptions, &c., should be sent to the "Publisher," Electrical Review, at above address.

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Cheques and Post-office Orders (on Chief Office, London) to be made payable to H. Alabaster.

CORRESPONDENCE.

THE ELECTRIC LIGHT IN DUNDEE.

To the Editors of The Electrical Review.

Dear Sirs,—I was surprised to see in your issue of November 25th a rather sharp editorial note on the lighting of Commercial Street, Dundee, by the Brush arc system.

No account appears to be taken of the fact that the installation is not a permanent one, but improvised with a small portable engine and dynamo for a month's trial.

The lighting, moreover, appears to give general satisfaction, and certainly I have myself never seen the Brush arc lamps burn better and give a better effect than they do in Dundee. The illumination is strong, powerful, and steady, and at the height of 20 feet, at which the lamps are fixed, the angle of greatest intensity is most advantageously placed.

My opinion, which may be influenced, is supported by that of strangers from London, who have expressed their admiration at the light and its superiority over many of those of the metropolis.

I was determined not to disappoint the people of Dundee by delaying lighting up, though the night on which steam was first raised was blowing a heavy gale of wind and rain such as made any attempt to adjust the lamps impossible.

Faithfully yours,

E. D. BECKINGSALE,

General Manager and Electrician.

Dundee, *November 29th*, 1882.

ELECTRICAL ENGINEERING.

To the Editors of The Electrical Review.

Sirs,—Referring to a letter published in your issue of November 25th, signed "Yoshi," I beg to state that I have myself noticed in many of the electric light installations evidences of a want of the most elementary practical knowledge on the part of those intrusted with the work, and I feel convinced that more than half the failures and so-called accidents may be traced to inefficient workmanship.

I notice also in the same issue a letter from one of the City and Guilds students, complaining that sufficient practical instruction is not given. Will not this in some measure account for the former?

It is a pity electric light companies will not forego some of the prejudice they appear to have against the employment of old tried telegraph engineers, as one ounce of practice is worth a pound of theory, and many of these possess both. I enclose my card, and remain,

Yours truly,

November 30th, 1882. X.

ELECTRICAL ENGINEERING CLASSES.

To the Editors of The Electrical Review.

Gentlemen,—The replies to your request for information as to electric engineering classes seem to show a very unsatisfactory state of things at Cowper Street, and Mr. Cockburn's letter may not receive the credence to which it is entitled, he being an official of the laboratory.

I am glad to say that my experience of Cowper Street was very different to that related by "Sea Boots" and "F. W. F." I attended the electrical engineering classes there in 1880-81, and learned a great deal from them. The lectures were clear, well arranged, and easy to follow; my only complaint at the time was that Professor Ayrton was only too ready to repeat, in answer to questions, what he had already clearly gone through. There were few experiments at the lectures for the reason that they mainly dealt with subjects requiring quantitative results. Such experiments cannot be performed on the lecture table to any good purpose. In the laboratories, too, the apparatus for each experiment was all carefully arranged, and written instructions concerning them attached. Copies of these instructions could also be obtained for reference in working out the results. The instructions clearly described the method (connections, &c.) of experiment, the results to be noted, and the method of using the results in tables, graphic records, &c. In addition, both the professor and the demonstrators were always in my experience ready to make clear any difficult point, answer questions, and make suggestions to the students. Care was taken that the experiments were carried out properly. Questions too were given every week by Professor Ayrton, arising out of his lectures, such questions being designed to show the students the practical value of the theory taught. As to the objection that theory is not wanted in such lectures, I must differ from "F. W. F." The mechanical construction of lamps and machines is easily learnt in practice, the theory of their action is not.

Professor Ayrton taught me much that I have never seen in print, at least in an intelligible form. It may be in some works, but wrapped up in *f*'s, *d*'s, and other mathematical formula not understood of the many.

The real cause of the dissatisfaction expressed by "F.W.F." and "Sea Boots" is doubtless the overcrowding at Cowper Street. I should be very sorry to be one of 300 students in the temporary class rooms and laboratories.

I am, yours truly,
HENRY M. SAYERS.

Grove Road Chambers, Eastbourne.
December 5th, 1882.

To the Editors of The Electrical Review.

Dear Sirs,—"Sea Boots" so thoroughly endorses all that I said in respect of the classes at the City and Guilds of London Institute, that I do not deem it necessary to make any comment upon Mr. Cockburn's criticism of my letter.

As regards the query expressed by "Sea Boots," I am only attending the Friday evening lectures at present.

Yours faithfully,
F. W. F.

London, *December 6th*, 1882.

THE LANE-FOX EPISODE.

To the Editors of The Electrical Review.

Sirs,—In your last issue in the report of the meeting of the Scottish Brush Light Company, I read that a statement was made by a shareholder that the sum of £21,000 had been offered to rectify the Lane-Fox blunder in another company. This statement appears to have been met with cries of "No! No!" and "Not one penny!" from the chairman.

The statement *is* absolutely true. The directors of the Birmingham and Warwick Brush Company have submitted to the shareholders a proposition made by the Hammond Company for the re-purchase of the Lane-Fox lamp. For this re-purchase the Hammond Company have offered the sum of £21,000.

Taking into consideration the enormous sum received by the Hammond Company out of the Birmingham and Warwick Company's capital, the sum of £21,000 may possibly be considered as, comparatively speaking, "Not a penny!" as the offer is totally inadequate to compensate for the misstatement.

Yours truly,
"POST TENEBRAS, LUX!"

ARC AND INCANDESCENT LAMPS ON THE SAME CIRCUIT.

To the Editors of The Electrical Review.

Dear Sirs,—May I be permitted to claim that this company (the Manchester and District Edison Electric Light Company, Limited) is equally with Mr. Gülcher's, able to meet the requirements of the public, inasmuch that for some months past we have had in two installations both arc and incandescent lamps fed from the same mains and with most satisfactory results?

Yours truly,
M. RUDDLE,
Electrician to the Company.

Manchester, *December 4th*, 1882.

THE SEA—A SOURCE OF POWER.

To the Editors of The Electrical Review.

Gentlemen,—Such a subject as the above is one which should prove of interest to and worthy of the attention of your readers, for as engineers we are continually being called upon to deal with power in one or other of its various forms, and it behoves us ever to be on the alert to investigate any new source of energy, or method of application of existing forces, that may come under our notice.

I have, therefore, much pleasure in directing your attention to what will, I think, when taken in hand by able men, be found a source of immense power. I refer to the sea, and no one can doubt that when agitated by a gale of wind great power is there developed, but the question is how to take advantage of it; and unless we admit that word "impossible," so seldom found in the engineer's dictionary, we can overcome the obstacles that present themselves, and reap the advantage of this great force of nature.

The practical details of such a scheme form the chief detriment to its successful application, and I must here explain that, in introducing this subject to you, I wish it understood that my main object is that by open discussion we way settle this question, "Can the energy of the waves be turned, by the appliances of modern science, into a form applicable to the present demand for motive-power?"

In considering this question we must not overlook the fact that it is but the utilisation of the great power of nature by a new method. Hitherto, in using coal we have been, as George Stevenson remarked about his locomotive, "using the power of the sun from a reservoir which has been an immense time in the course of preparation;" and who shall say that the ingenuity of man cannot discover and tap other reservoirs at present unsuspected.

Our coal fields may in course of time be worked out, but the natural causes that formed them have not ceased, and so we must look for other means of obtaining the advantages of their action.

Now, those who have seen a storm at sea have no doubt been struck with the immense forces at work there; in fact, it is in a hurricane at sea that the power of nature appears the most formidable, and an engineer is well aware that to throw about a ship and cargo, weighing perhaps 5,000 tons, demands an expenditure of energy that makes our most powerful efforts sink into insignificance.

Of course, it may be objected that this action is not constant; in reply, I can only say we might as well argue that because rain does not continually descend men must die between the showers.

You will see, gentlemen, I mean a storage reservoir is required, and recent discoveries in electricity have made its accomplishment possible. First, it is necessary to ascertain accurately the motion of the wave, that we may decide as to the most effectual manner of utilising its force.

The diagram shows by the upper full curved line the surface of a wave of the following properties:—

Velocity 20 knots per hour, or 33·76 ft. per sec.
Length 224·7 feet
Height 18·7 feet
Period 6·58 seconds.

Each of the other full curved lines represents a sub-surface of equal pressure, and it will be here noticed that the movement of a particle at the surface is great, whilst as the depth increases it becomes less and ultimately insignificant.

The still water level is shown by a full horizontal line, and the dotted vertical lines divide still water into eight equal and rectangular blocks, which assume the positions shown by the full inclined and slightly curved lines when disturbed by the wave.

The surface particles have a circular motion through an orbit, of which the height of the wave is the diameter; for sub-surfaces the motion is exactly similar, but proportionately less, as shown, the horizontal level of their centres is slightly above still water level, owing to the crests of waves having a more peaked form than their trough. The motion of elevation and depression of a particle is part of its circular motion, which motion is indicated in the diagram by dotted circles, and their comparative movement of particles for different depths is approximately found thus:—

Let motion at surface equal 1,
at depth equal to $\frac{1}{9}$ length of wave it equals $\frac{1}{2}$
" " $\frac{2}{9}$ " " $\frac{1}{4}$
" " $\frac{3}{9}$ " " $\frac{1}{\ }$
" " $\frac{4}{9}$ " " $\frac{1}{16}$
" " $\frac{5}{9}$ " " $\frac{1}{32}$

and so on, so that any substance at the surface would move the whole height of the wave, and at a depth equal to the length of the wave its motion would be only about a 512th part as much.

The effect of a forward motion of a quarter of a wave length is shown on the diagram by long dashes — — —, from which can be seen the change of position of any particle and the circular path it has travelled.

In the centre of the diagram is shown the greatest variation that takes place in any body of water with this size of waves, that is, the shape of the water at the trough and at the crest are compared.

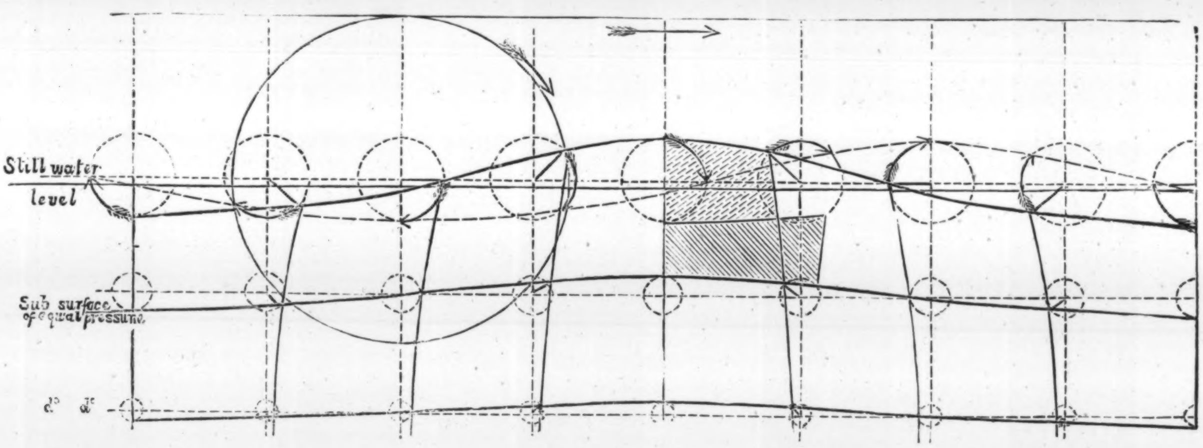
The particles at the surface of such a wave move at the rate of 8·7 feet per second through their circular orbit.

The mechanical energy in a mass of water of given area and unlimited depth agitated by such waves is thus found: Multiply the area by one sixteenth part of the square of the height of the wave and by the heaviness of the fluid (64 lbs. per cubic foot for sea water).

Take a square having sides of 100 feet length, which encloses an area of 10,000 square feet. Multiply this 10,000 by the square of the height of the wave divided by 16, that is, by 349·69 divided by 16, or 10,000 times 21·8, giving 218,000. This result is to be multiplied by 64, the weight per cubic foot of the fluid, which makes 13,952,000 lbs.

One half of this energy consists in elevation, the other half in motion.

The amount 13,952,000 found above, I take means that an expenditure of that amount of energy is necessary to counteract the force of the wave, and the waves have a period of 6·58 seconds, that is, whatever position they may occupy at any given time, the same effect takes place at regular intervals of 6·58 seconds, or the sea has, so to say, 9 revolutions per minute, which multiplied by 13,952,000 and divided by 33,000, gives the horse-power developed, the result being 3,835 horse-power, an enormous amount if we can fully utilise it.



It may be thought that I have taken a wave size that would be seldom available, so I will add a few comparisons.

Observe in the North Atlantic record waves of 24 and 30 feet high, highest being 43, mean 18, in westerly gales.

In the Pacific ... ... 32 feet is recorded.
South Atlantic 22 " "
Cape Horn ... 32 " "
Mediterranean 14½ " "
German Ocean 13½ " "

and French sailors mention 36 feet in the Bay of Biscay. Now I have taken 18·7 feet, about the mean height of Atlantic waves in westerly gales.

From this diagram and calculations you see, gentlemen, just the motions of the wave and the power in them. The question now is to design an apparatus to take advantage of it.

There can be no doubt of the importance of this subject, as it is plain that the time has now arrived when cheap methods for the artificial production of electricity are urgently required, and the invention or discovery of a simple and effective converter of natural energy into electricity will be a great step towards rendering this motive-power the principal one of the age.

The following from the *English Mechanic* of September 9th, 1881, will show how such a subject is regarded.

"There is abundant evidence in the proceedings at the meeting of the British Association to show that we are on the eve of a great revolution in our methods of utilising the available sources of energy. Sir W. Thomson and Sir W. G. Armstrong both addressed themselves to an elucidation of questions which are just now attracting the attention of mechanical engineers and physicists, and the modern developments of electric science warrant the tone of confident anticipation in which the two presidents spoke to their respective sections."

The suggestions of Dr. Siemens that it is possible to utilise the gigantic power of such a waterfall as that of Niagara, have given rise to speculations which in the immediate future will play a very important part, and the recent exhibitions in Paris and Munich will direct the attention of many minds to a subject of growing interest.

Sir W. Thomson has reviewed the sources of energy which man can utilise, and dwelt with special emphasis on the value of wind and water-power in combination with the artificial production of electricity.

Sir W. Armstrong has drawn attention to the fact that we had nearly reached the limit of possible development of the steam-engine. He also says if we could produce electricity with the same facility and economy as we can produce heat the gain would be enormous, and the question then arises whether we cannot actuate dynamo machines by natural forces and save our coal for other purposes. As a secondary motor, the dynamo machine has already been utilised in several ways, and if we can actuate it by some power which is at present allowed to run to waste the gain will be just the value of the coal and the interest of the capital that would otherwise be expended in laying down motive-power engines. Of the available sources of energy other than fuel, we have wind-power, water-power, and tidal-power, but so far as the latter is concerned it is, as Sir W. Thomson has shown, comparatively insignificant.

In wind-power and water-power we have agents which cost nothing, and though as far as the latter is concerned in the country best known to me (Australia) we had little more than the power of running water, the former may possibly, with the aid of recent inventions, be turned to good account.

It is not improbable that further investigations may lead to greater improvements in accumulators, and then electricity will become the motive-power *par excellence* and steam will cease to be "King," though he will doubtless remain Prime Minister for many years.

I think, gentlemen, you will see from the above that this sort of subject is agitating scientific minds, and its importance cannot be exaggerated. I therefore conclude with the hope that Electrician and Engineer may put their heads together, and add that it is my firm belief that one of the most important questions they can settle is

"What are the wild waves saying?"

C. SCOTT SNELL.

FRAGVIS.—The number of poles per mile on the General Post-office twisted telephone circuit between Manchester and Liverpool averages 27, the distance between the poles therefore averages about 66 yards; the complete twist is completed every four poles length. There is no book which completely enters into the question of the laws which govern the lines of magnetic force and the theory of dynamo-electric machines based on those lines; opinions differ very considerably on the subject, you would probably get most information, however, from "Electric Illumination," Vol. I., edited by J. Dredge and published at the offices of *Engineering*, 35, Bedford Street, Covent Garden, London, W.C. You must have misunderstood the meaning of the statement which you say is found in most text-books, what it is probably intended to explain is that the current produced by induction is only a momentary one, and that as long as the current continues to flow without change in strength in the circuit which has caused that induction current to be set up, then no further induced current will be generated, or that *one* circuit cannot induce more than *one* current in *one* other circuit at the same time. As a matter of fact, if there were 20 wires in the proximity of a single wire through which a current was caused to flow, induction currents would be set up in all the 20 at the moment when the current commenced or ceased to flow, or when it varied in strength. There is no book which treats of the subject of induction with particular reference to telephone circuits.—Eds. Elec. Rev.

NOTES.

Notice to Readers.—Subscribers are hereby notified that in future the supply of back numbers of the Electrical Review cannot be guaranteed by the publisher; it is therefore expedient that those who desire to complete their sets should do so at the first convenient opportunity. The publisher also desires to give notice that after December next all copies dated six or more months previously will be supplied only at enhanced prices, that is to say, 4d. numbers will be charged 6d., and others at similarly advanced rates.

Society of Arts.—Since the commencement of the present session, the society meeting room has been lighted by means of electricity. A Siemens dynamo-electric machine is employed, driven by an eight-horse-power Crossley's gas engine. Nearly the whole cost of these was defrayed by subscriptions from a few past and present members of the society's council. The lamps used are those of Edison, and there are at present fifty of them in the room. The chandeliers now in use have been lent by Messrs. Verity, who are constructing chandeliers to be permanently fitted, now that the number of lights to be used has been decided upon. Temporary fittings have been put up in the council room, and the result having been proved satisfactory, it is in contemplation to arrange for the lighting by electricity of this and other parts of the building.

Bradford Technical Exhibition, 1882.—This exhibition, which was brought to a close last week, has been lit up since its commencement by the Yorkshire Brush Electric Light and Power Company (Limited), of Leeds, who have been awarded a gold medal for their exhibit of electrical apparatus at the above place.

Electric Lighting.—We learn from Mr. Magnus Volk that the new Town Hall, West Brighton, which is to be opened on the 13th inst., is to be illuminated by means of Swan's incandescence electric lamps. The Pavilion committee of the Brighton Town Council have also decided to light that building on the "Swan" system by electricity, and both operations will be carried out by Mr. Volk. The number of lamps required will be considerable, and we wish the undertaking every success.

The authorities of Brighton are generally ready to take almost any measures which may benefit the town, and we may therefore expect to hear of many installations of incandescence electric lighting in this fashionable watering place, more especially as the introduction of the Ferranti machine would so materially reduce first cost.

We understand the Yorkshire Brush Electric Light and Power Company (Limited), of 1, East Parade, Leeds, has secured a contract for the lighting up of the market-place and principal streets of Dewsbury, Yorkshire, during the forthcoming Christmas holidays, and this company is now putting down machines and erecting wires and camps for running about sixteen 2,000 candle-power Brush arc lights.

Application from the Brush Electric Light and Power Company and the Carbon Electric Light Company, for lighting the streets of Dundee, were produced at the meeting of the Watching and Lighting Committee, held on Tuesday, and remitted to a sub-committee.

On Saturday last, by permission of the Union Steamship Company of New Zealand, an exhibition of the Edison incandescent light was given on board the s.s. *Tarawera* at Albert Harbour, Greenock. A private view was held during the afternoon, at which a large and influential company was present, and in the evening the vessel was thrown open to the public at a small charge per head, the proceeds to go to the Greenock Infirmary. Among those present in the afternoon were Mr. James T. Bottomley, F.R.S.E.; Captain Watson, of the Cunard Company (in the absence of Mr. John Burns, of Wemyss Castle); Captain Liest, of the North German Lloyd's; Mr. Napier, shipbuilder; Mr. Hugh Brown, director of the Caledonian Railway Company; Captain Williamson, of the river steamer *Ivanhoe;* Mr. John Darling, superintendent of the Union Steamship Company; Mr. Bennet, Mr. Hislop, gas manager, Paisley; the Messrs. Henderson, shipbuilders; Mr. John Scott, shipbuilder, Greenock; Commander Hereford, of H.M.S. *Warrior;* Mr. Brock, of Messrs. Denny & Co., the builders of the *Tarawera;* Mr. Alexander, of the Guion Line; Mr. F. W. Allan, of the Union Steamship Company of Southampton; Mr. Charles T. Grant, Glasgow agent for the Edison Electric Light Company; the provosts and magistrates of Glasgow, Greenock, and other neighbouring burghs, &c.

The *Tarawera* is one of the latest vessels built by Messrs. Denny & Co., Dumbarton, for the Union Company of New Zealand. She is the first ship in this country lighted by the Edison Company, who have appointed Mr. C. T. Grant, 160, Hope Street, Glasgow, their agent. The company present expressed great satisfaction with the results of the system. Every part of the vessel from stem to stern was lighted by the electric lamps, which number 150 in all. Each stateroom has one lamp enclosed in an opaque globe, which makes the light very pleasant, though without the opaque glass the light is by no means unpleasant to the eye, but steady, brilliant, and mellow. In the saloon the lights are enclosed in large handsome opaque globes, while in addition the whole ship is fitted with the ordinary oil lamps ready for use. The motive-power is supplied by a Brotherhood three cylinder direct-acting engine, working at a speed of 470 revolutions per minute, and driving the 150-light dynamo machine direct. The normal speed is 850 revolutions per minute, but to suit the circumstances of the case the electricians of the Edison Company have made certain modifications, which enable it to be run at a lower speed without lessening its supplying power. The engine is placed near the steam-engines for driving the propeller of the vessel. The space taken up by the dynamo and engine, which are coupled together on the same bed flat, is nine feet by two feet six inches. The lamps throughout the ship are each 16 candle-power actual, and those in the staterooms are provided with a tap by which they can be turned off or on. The wiring throughout the vessel is done with copper wire, covered with four separate coatings of insulating material; while at every point where wires branch off to supply lamps or groups of lamps a safety fuse is inserted. The tunnel-way of the shaft, which is lighted by only two lamps, gave immense satisfaction to many ship captains and others, as the light was perfect in what is usually one of the darkest and most difficult places of the ship. All on board were highly pleased with the system, including several gas engineers of the highest eminence. We are informed that Captain Williamson, of the *Ivanhoe*, has decided to light his steamer during the evening cruises next summer with the electric light. Notwithstanding the heavy rain on Saturday evening large numbers of people visited the ship, all seeming to be much interested in the practical application of the mode of lighting.

Mr. Fowler laid before the Lambeth Vestry the report of the delegates appointed to attend the electric lighting conference held recently in the Camberwell Vestry Hall. He said he regretted that such an important matter as electric lighting was thrown upon the shoulders of the local authorities in the manner it was by the Act of Parliament, because he was satisfied that the electric light had not yet had a sufficient trial to make it a form of illumination which the vestry or any other public body could deal with. There had then been received at the Vestry Hall plans of one of the companies which proposed to bring the electric light into Lambeth, and it appeared from these that the light would be laid on in the main roads from Westminster, Waterloo, and Vauxhall, right through to the upper part of Brixton Hill. Now, considering that in the parish of St. James', Westminster, which had a comparatively small area, it was calculated that the expense of the electric light would amount to £144,000, they could approximately estimate what it would cost to introduce all the necessary appliances into so extensive a parish as Lambeth. The expense would simply be enormous. The powers given to the electric lighting companies were, in fact, so extensive that it would be difficult to say to what extent they would, if carried out, affect the roads and sewers of the parish. The conclusion arrived at by the conference held in Camberwell was that the local authorities should be advised to apply for licences, so as to keep the power in their own hands. He concluded by moving that the necessary steps be taken by the clerk to call a special meeting at which the question of applying to the Board of Trade would be considered. The special meeting will probably be called for early in January.

A LETTER was received by the Newington Vestry from St. George's, Hanover Square, forwarding a report on the Electric Lighting Act adopted by that vestry. They declined to give any consent to or support any application for provisional orders from the companies. At the same time they were not prepared to apply for a licence themselves.

A LETTER was also received from the Metropolitan Brush Company announcing their intention to apply for a licence to supply St. Mary, Newington, St. George the Martyr, Southwark, and St. Saviour's, Southwark. They sought to lay wires along the Walworth Road, Newington Butts, Great Dover Street, Blackman Street, Newington Causeway, Kennington Park Road, and elsewhere. They also sought to obtain the site of Horsemonger Lane Gaol and other sites as stations. On the motion of Mr. Marsland it was agreed that all the notices and plans on this subject be referred to the Works Committee for consideration and report.

IN the Court of Common Council, last week, Mr. Deputy McGeorge asked the chairman of the Commissioners of Sewers what was the extent of the area of the City under the control of the Commission already lit by electricity, and if they proposed to extend the same? Also whether the question of lighting the whole City by electricity had been considered by the Commission recently, and if so did the Commissioners propose to do the work themselves, or was it proposed to invite companies to undertake the work under the powers of a provisional order?

Mr. Felton (chairman of the Commissioners of Sewers) could not give the exact area of the City that was at the present time lighted with the electric light, but he gave the names of the streets. With regard to the second question he might say that he believed the intention of the Commission was to have the whole City lighted by the electric light. The whole matter was now under consideration, and would be brought up at the next meeting of the Commission, whether the companies should be allowed to treat or compete for the lighting, or whether the City would take it up itself.

Later on, Mr. Felton said, in answer to Mr. Deputy Fry, that the time had gone by for them to apply for an order under the Electric Lighting Act, but they could apply for a licence under that Act at any time. The difference between the provisional order and the licence was this, the provisional order would be for twenty-one or more years, subject to the approval of Parliament, while the licence would be for a term not exceeding seven years.

AT a meeting to consider the question of qualification of members of the Commission of Sewers, Mr. Stoneham moved, "That the following be a standing order of this Court, viz.: That no member of this Court who shall be a shareholder in, or concerned for, or in any way pecuniarily interested in any lighting company applying for permission to light, or actually lighting, the City of London, shall be appointed or continue a member of the Commission of Sewers." Mr. H. Gover seconded the motion. He was astonished to find that in the Commission of Sewers a large number of gentlemen interested in the electric light voted in a division on this important subject, and carried a resolution as he thought adverse to the interests of the Corporation by a majority of one. If this question of the electric light was being decided by interestsd persons it was a great shame, and should be put a stop to. Mr. Fricker moved, as an amendment, "That no member of this Court who shall be a shareholder in, or concerned for, or in any way pecuniarily interested in any lighting company applying for permission to light, or actually lighting the City of London, shall vote upon any question before the Commission of Sewers affecting the lighting of the City, or take any part in the discussion of any such question."

Mr. Fricker's amendment was afterwards agreed to.

Apropos of this the *City Press* says:—"Is not Mr. Stoneham's motion in the Court of Common Council, with reference to members of the Commission of Sewers being shareholders in electric lighting companies, unnecessary? No member can vote upon a question in which he is pecuniarily interested, and what more can be wanted?"

A DEPUTATION, representing the principal corporations of England and Scotland, had an interview on Tuesday last with Mr. Chamberlain at the Board of Trade, on the subject of the Electric Lighting Bill, to urge upon him the importance of making the use of the electric light permissive, and not obligatory. Mr. Arnold Morley, M.P., introduced the deputation.

Mr. Littler, Q.C., stated the views of the deputation, and Mr. Chamberlain made a long reply. The matter seems to be very well commented upon by the *Globe*, in a short article which reads as follows:—

"A bold attempt was made by some of the most important city corporations of England to protect themselves against the threatened introduction of electric lighting into the districts administered by them. Their application to the Board of Trade had a very harmless appearance, as it professed only to ask that the use of the electric light should be made in each case permissive and not obligatory upon the applicants. If it were possible to accept this as a true description of the privilege which the corporations wish for, no one would be so hard-hearted as to wish that the request should fail. There is no doubt that at this time a great disposition to threaten the local authorities in large towns with an invasion of the rights they have so long enjoyed by substituting for the old-fashioned system of gas lighting, over which these corporations often exercise complete control, an electric scheme to be carried out by a wholly independent body. The corporations will be put to much trouble and expense in combating such schemes, even where these are worthless or of doubtful utility; and they are anxious to devise some plan by which they will be saved from these inconveniences. But the device they have hit upon, and which the deputation was yesterday charged with advocating before Mr. Chamberlain, is one of a kind that cannot be accepted in blind faith by the public, if it is at all desirous of allowing the new light to have a fair trial. The proposal is that corporations should themselves acquire powers to apply the electric light, but without being at the same time compelled in the usual way to apply it without delay. They would by this means procure for themselves the right to exclude all other applicants, and if by any chance their desire to introduce the new light should die a natural death after the order was safely obtained, there would be no means whatever of introducing it, however much desired by the public. It is not surprising that the Board of Trade should hesitate before acceding to such a request. The corporations may call it a permissive scheme which they advocate, but the name is not well chosen. For corporations, as well as other bodies, are already 'permitted' to apply for lighting powers if they choose. What they now want is, not permission, but a right to exclude other applicants by obtaining for themselves a privilege which they have, to say the least of it, no burning desire to exercise immediately."

On Saturday last, at the meeting of the Electric Lighting Committee of the Corporation of Leeds, the following important correspondence between the Town Clerk and the Board of Trade was read:—

Town Hall, Leeds, *November 25th*, 1882.

SIR,—I have received the instructions of the Electric Lighting Committee of the Leeds Corporation to communicate with you with regard to the terms of the proposed provisional order which the Corporation is about to apply for under the Electric Lighting Act, 1882. Will you permit me, in the first instance, to respectfully lay before you the position which the Corporation of Leeds has taken with regard to the electric lighting question?

So far back as last May the Corporation appointed a committee to make inquiries with regard to the practicability of supplying Leeds with the electric light, and that committee, after making considerable investigations in London and elsewhere, published a careful report upon the subject.

Again, immediately upon the Act of last Session becoming law, the Corporation appointed an Electric Lighting Committee (as contradistinguished from the Gas Committee) to further consider the question of applying the system of electric lighting to this borough. There was then, and has been all along, a *bonâ fide* desire on the part of the Corporation of Leeds to give the new light a fair trial, and, if it should be found feasible, to utilise it in some parts of, if not throughout, the borough.

I was simply stating, in the evidence which I gave before the Select Committee on the Electric Lighting Bill, what I knew to be the feeling of the members of the Corporation of Leeds, when I said that there was certainly no desire on their part to obstruct the electric light, but, on the contrary, a determination to adopt it if it should prove to be a better light at as cheap a rate as gas, and that notwithstanding that the corporation had invested nearly a million of money in a large gas undertaking. I also ventured to point out to the Select Committee that the Corporation of Leeds having given the gas consumer the benefit of the profit arising out of the gas system, and thus having reduced the price of gas to 1s. 10d. per thousand cubic feet, had done nothing as a lighting authority to disentitle it to the confidence of Parliament or of the Board of Trade.

The action of this Corporation has, since the Electric Lighting Act came into force, been most carefully and anxiously considered by the Electric Lighting Committee, and that committee has felt justified in recommending the Town Council to apply for a provisional order with a view to the matter being dealt with by the Corporation itself, as the local authority. The question now arises as to what conditions the Corporation is to be placed under in this proposed provisional order.

It has been stated that the Board of Trade will insist upon a clause being inserted in all orders providing that the duty to supply the electric light shall be forthwith made obligatory upon corporations. I respectfully submit, on behalf of the Corporation of Leeds, that the clause which we are entitled to ask to be inserted in our order should be of a permissive and not of a compulsory character—with a proviso, if the Board of Trade should think fit, giving power to that body to revoke the order if no *bonâ fide* attempt were made within a reasonable time to carry out the spirit of such order.

We venture to assert that what we have done in the past with regard to the question of lighting is a sufficient earnest and guarantee that, so soon as the new light can be made a commercial success, advantage will be immediately taken by the Corporation to give the benefit of it to the ratepayers of this town.

To-day is the last day for the insertion of advertisements by companies intending to apply for provisional orders, and no company has inserted an advertisement indicating that it intends to apply for an order with regard to Leeds. I wish, however, that it should be distinctly understood that no advantage will be taken of this, and that it will not in any way interfere with the proposed application of the Corporation.

I may say that the Corporation is at present in communication with several electric lighting companies with a view to receiving tenders from such companies for the lighting of the town hall, public offices, and other contiguous buildings, and that it is the intention of the Corporation to have the buildings referred to lighted with the electric light immediately.

The Electric Lighting Committee, however, is anxious, with a view to its own guidance, to ascertain the feeling of the Board of Trade with regard to the question of compulsory supply.

It is unwilling to believe that, in a case such as I have ventured to place before you in this letter, the Board of Trade will insist upon a clause being inserted in the order the effect of which will be to involve an immediate large outlay of capital—the money of the ratepayers—at a time when no one can with certainty predict that such expenditure will be justifiable.

I am, Sir, your obedient servant,

GEORGE W. MORRISON, Town Clerk.

The Right-Hon. Joseph Chamberlain, M.P., President of the
Board of Trade, Whitehall, London, S.W.

Board of Trade (Railway Department), London, S.W.,

November 30th, 1882.

The Electric Lighting Act, 1882.

Sir,—I am directed by the Board of Trade to acknowledge the receipt of your letter to the President of the 25th inst., in which, by instruction of the Electric Lighting Committee of the Leeds Corporation, you state their wish to be informed of the views of this Board upon the question of the conditions they may require to be inserted in the provisional order which the Corporation are about to apply for under the provisions of the above-mentioned Act.

The Board of Trade desire in the first place to point out that it would be premature before they have the proposed order before them to attempt to give an opinion upon the scheme, or to foretell the form or substance of conditions which they may find it necessary to introduce therein.

But the Board of Trade have no hesitation in saying that in their opinion it was the intention of Parliament that the schemes to be sanctioned by licences or provisional orders under the Act should be *bonâ fide* schemes for definite undertakings, and not schemes containing general powers authorising a corporation or a company to light all or any portion of a town if, when, and as they might in their discretion think it desirable to do so. It would further, in their opinion, be clearly contrary to the intention of Parliament to sanction a scheme which merely enables the promoters to appropriate an area of supply to the exclusion of other applicants.

The exact amount of definition necessary in the order, the precise time within which the compulsory supply shall be given, in what cases, at what times, and under what conditions the proposed works must be executed, are matters which can only be determined when the schemes are actually before the Board of Trade. But about the principles above indicated, the Board of Trade have no doubt, and they will feel bound to act upon them, whether in dealing with the case of a corporation or a company.

I am, Sir, your obedient servant,

HENRY G. CALCRAFT.

The Town Clerk, Town Hall, Leeds.

The Leeds Committee subsequently passed this resolution:—"That the Provisional Order be proceeded with, and that the Town Clerk represent the Corporation of Leeds at a meeting to be held in London on Tuesday, the 5th inst., of representatives of the various corporations which are promoting Provisional Orders."

Medal Commemorative of the Exposition d'Electricité of Paris in 1881.—M. le Ministre des Postes et Télégraphes is now distributing to all persons who participated in the Exposition Internationale d'Electricité of Paris, in 1881, a commemorative medal of which we hope to reproduce the fac-simile in our next number.

Société Française de Physique.—On the occasion of the November 17th sitting, M. Cabanellas gave his theoretical researches upon the transmission of power by electricity. We need not remark upon it here, since the work of M. Cabanellas was published in the Electrical Review for November 25th. The sitting of the 1st December, which did not bring forth an electrical communication, was, however, marked by an incident to be regretted from all points of view. The Société Française de Physique sends to all its members, three or four days before each sitting, a small circular which contains the order of the day of the next sitting and the *résumé* of the communications made in the preceding sitting. M. Marcel Deprez imagining, rightly or wrongly, that the *résumé* relating to the discussions which followed the communication of M. Cabanellas, did not represent faithfully the character of the sitting of the 17th November, at which, however, he was not present, thought proper to resign his membership of the Société. This resignation was accepted, but we must regret the deed, resulting from a moment of pique, which deprives the Société of one of its most valuable members and seems to put under suspicion the high and indisputable impartiality of the officers of the Société. In our opinion, a simple verbal rectification would have been quite sufficient.

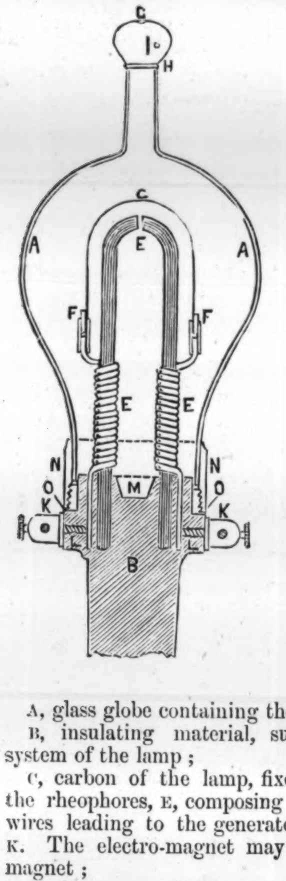
The Incandescent Lamp with Magnetic Super-excitation of M. Cloris Baudet, of Paris.—John Banting Rogers is surpassed, the man with the "multiple binding screw" is no more than an inventor of the fifteenth order by the side of the designer of the wonderful lamp of which we cannot help giving a complete description to our readers. It will be seen that Edison has not yet patented everything, and that the field still remains open for further progress. The origin of this invention is indeed curious. The author, in a small pamphlet devoted to his ideas, reminds us of all the inconveniences with incandescent lamps (platinum or carbon), and informs us that to meet all these inconveniences was not an easy matter, and that all his attempts fell into the same groove. We will quote here his own words:—

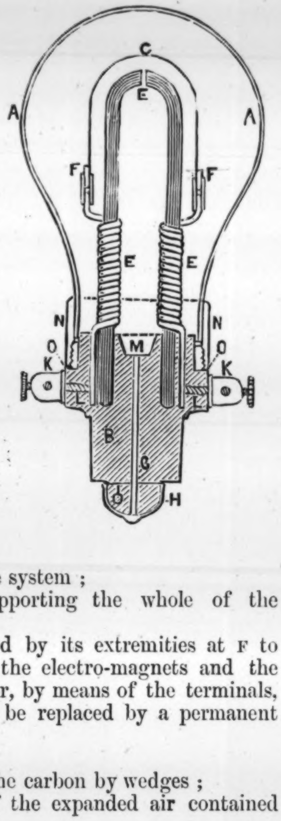
"At last, after seeking the desideratum without success, I had abandoned it when, in making some experiments upon platinum, I observed that when this wire is heated to redness by the passage of an electric current, if one presents to it the poles of an electro-magnet actuated by a powerful current one sees the wire, opposite the magnetic core, from being red become white, without this degree of incandescence producing fusion of the metal. This discovery seeming very remarkable to me (we can scarcely believe it), I sought to utilise it by employing in the lamp an electro-magnet, which, by reason of its disposition parallel to the carbon, and by its influence upon it, produces a white light when, *without this magnetic superexcitation*, it would only be red."

This is clear, is it not ?

Following this are some considerations of the so-called practical vacuum in the lamps, a vacuum which, according to the inventor, is *unimportant*, and a hint at the end which is of inestimable value—"This lamp will not be sold for some months ; its price will not be high ; meanwhile we are ready to utilise *those which are actually in the trade*" (*sic*). The inventor is not a bad man of business.

In order not to be accused of exaggeration, we reproduce here the inventor's drawings and the written description of the lamp, copying the prospectus, which is in our hands :—





A, glass globe containing the system ;

B, insulating material, supporting the whole of the system of the lamp ;

C, carbon of the lamp, fixed by its extremities at F to the rheophores, E, composing the electro-magnets and the wires leading to the generator, by means of the terminals, K. The electro-magnet may be replaced by a permanent magnet ;

E, electro-magnet ;

F, mode of attachment of the carbon by wedges ;

G, aperture for the escape of the expanded air contained in the globe ;

H, india-rubber capsule forming a valve at I at the escape aperture (this valve may be arranged in any suitable manner) ;

K, terminals insuring contacts at L for the passage of the current from the interior to the exterior of the lamp ;

M, receptacle intended to contain any absorbent materials considered necessary ;

N, metallic ring cemented to the globe into which the system, B, is screwed at O, resting upon a leathern washer to insure hermetical sealing ;

(N.B.—One could, nevertheless, if one considered it necessary, make the vacuum by the escape aperture or by an opening made in the cylinder, B, with a valve *ad hoc*.

The ideas of the inventor on electric measurements are also quite original, and he derides the ohm, volt, &c. All this is replaced by a simple galvanometer with two wires ; you place the two wires successively upon the element of the battery to be tested, you read the deviations in degrees. . . . . and that is all. The element gives upon the fine wire 40° Cloris Baudet of the *force of electric tension* (*sic*) and 24° Cloris Baudet of quantity, you then know perfectly its value. What simplicity ! And this is printed in France in 1882, and there will be found a number of imbeciles to buy a *standard* Cloris Baudet galvanometer.

The Society of Telegraph Engineers and of Electricians.—The Annual General Meeting of the Society will be held at 8 p.m. on Thursday, the 14th December. The following paper will be read :—"The Application and Extension of Telephonic Communication in Japan." By Thomas J. Larkin, member.

Theatrical Performances and the Electric Light.—The *Figaro* says that "the incandescent lamps worn in the hair of four of the Peris at the Savoy on the opening night did not produce the happiest effect. The light dazzled the eyes and gave rise to an uncomfortable suspicion of possible danger. For, although the wires are doubtless completely insulated, yet a fracture or a rub would imply instant death to the unhappy lady who wears the lamp. It is, doubtful, after all, whether the game is worth the (incandescent) candle." If the author of the above extract is not making fun, we would advise him to investigate the danger by personal experience before writing again on the subject. Does not the writer know that "electricity is life ?"

The Gilchrist Lectures.—Dr. Lant Carpenter delivered the first of a course of lectures in connection with the Gilchrist Educational Trust, at Forfar, on Monday evening, and on Tuesday he repeated it at Arbroath. The subject was "The Production and Storage of Electrical Energy." At both meetings the attendance was very large.

Personal.—The Jablochkoff Electric Light and Power Company, Limited, has appointed Mr. Francis R. Reeves secretary and general manager to the company.

To Telephone Patent Infringers.—The *Edinburgh Courant* says : "The United Telephone Company have circulated a warning to any one selling or using without their licence, any form of telephone covered by the patents in the company's possession. Appended to the formal declaration that proceedings will be taken in case of any infringements to these patents are short *résumés* of cases decided in favour of the company, the chief being that against Mr. Alexander MacLean, of Edinburgh, in which an important judgment was pronounced by Lord M'Laren.

Electrical Power Storage Company (Limited).—We are informed that the Electrical Power Storage Company (Limited) will, from the 1st January next, be prepared to receive application for the supply of electrical accumulators for lighting or motive power, or for the undertaking of complete installations of electric lighting of districts, private houses and establishments, railway trains or ships.

NEW COMPANIES REGISTERED.

North Woolwich Telegraph Works Company (Limited).—Capital £100,000, in £10 shares. Objects: To carry on business as electricians, telegraph engineers, and contractors, manufacturers of electric appliances, and producers of light, heat, and power by electricity, magnetism, and galvanism. Signatories (with one share each): A. E. Tylor and W. L. Bright, 5, East India Avenue ; J. B. Ball, 1, Gresham Buildings ; C. O. Newman, Yeovil ; A. T. Atchison, C.E., 38, Parliament Street ; C. E. Harrison, Rochampton ; F. W. Smith, 155, Fenchurch Street. The signatories are to appoint the first directors. Qualification : Five shares. Registered 29th ult. by Gedge, Kirby, Millet, and Morse, 5, Lime Street Square.

North Atlantic Cable Company (Limited).—Capital £600,000, in £10 shares. Objects : To effect telegraph communication between Europe and America by submarine and other lines. Signatories (with one share each) : James Gordon Bennett, New York ; W. A. Simpson (manager), Hendon ; A. T. West, 44, Mount Pleasant Road, Lewisham ; T. W. Powell, 1, Drapers' Gardens ; A. H. Clark, 17, Stratford Place ; E. Heseltine, 1, Drapers' Gardens ; W. Huyshe, 46, Fleet Street. The signatories are to appoint the first directors and are themselves to act in the meantime. Qualification : Shares or stock to the nominal value of £1,000. Mr. Arthur Hamilton Clark is appointed managing director at a salary of £3,000 per annum. Registered 2nd inst. by Jackson and Prince, 61, Cannon Street.

NEW PATENTS—1882.

5669. "Apparatus for measuring or indicating electric currents." J. Blyth. Dated November 29.

5673. "Processes of construction and the construction of electric wires and cables." A. J. Boult. (Communicated by R. S. Waring.) Dated November 29. (*Complete.*)

5677. "Mechanism for regulating the production of electricity." H. Wilde. Dated November 29.

5693. "Improved means of and apparatus for telegraphing into and from railway trains in motion." W. L. Hunt. (Communicated by R. M. Hunter.) Dated November 30.

5695. "Process of and apparatus for generating and measuring electricity." V. W. Blanchard. Dated November 30. (*Complete.*)

5702. "Telephonic receivers." T. Torrey. Dated November 30.

5711. "Manufacture of conductors for electric currents." W. R. Lake. (Communicated by F. F. Fitch.) Dated November 30.

5715. "Manufacture of magnetic and ventilating wearing apparel for the prevention or cure of disease." W. R. Lake. (Communicated by S. A. B. Wilson.) Dated November 30.

5742. "Electric and magnetic apparatus for telephonic or other purposes." S. P. Thompson. Dated December 1.

5744. "Apparatus or appliances for automatically regulating electric currents." J. T. King. (Communicated by J. R. Finney.) Dated December 2.

5747. "Generating and utilising electric energy." A. J. Boult. (Communicated by B. Faquant.) Dated December 2.

5754. "Electrical switch for electrical lamps and other purposes." G. W. Bayley. Dated December 2.

5757. "Manufacture and preservation of insulated electric conductors and compounds that may be used for the same and for other purposes." E. T. Truman. Dated December 2.

5767. "Accumulators or secondary batteries. W. A. Barlow. (Communicated by L. Encausse and Canésie.) Dated December 4.

5769. "Improvements in electro-magnets and in electro-dynamo machines constructed therewith." E. G. Brewer. (Communicated by A. L. Bonnefils.) Dated December 4.

5779. "Electric lamps and switches therefor." A. Fergusson. Dated December 5.

5783. "Magneto and dynamo-electric machines." W. A. Barlow. (Communicated by W. E. Fein.) Dated December 5.

5796. "Electric lamps and lighting apparatus." W. R. Lake. (Communicated by R. H. Mather.) Dated December 5.

5797. "Primary voltaic batteries." T. J. Jones. Dated December 5.

ABSTRACTS OF PUBLISHED SPECIFICATIONS.
1882.

1794. "Apparatus for generating currents of electricity." E. L. Voice. Dated April 14. 10d. It is well known that when a core of soft iron coiled with wire is made to approach the pole of a magnet, currents of electricity are generated in the wire in an inverse direction to those which circulate, or are supposed to circulate—according to Ampère's hypothesis—around the magnet, and these currents have a mutual repulsion, consequently a force is set up tending to repel the coil from the magnet. When, however, the coil recedes from the magnet, direct currents, or currents circulating in the same direction as those of the magnet, are generated. The production of these alternately opposite currents offers a great resistance to the revolving armature in existing machines for the mechanical generation of electricity. It is also well known that if a number of permanent magnets be placed side by side with their like poles adjoining, thereby forming a battery of magnets with a plane surface, and if a piece of soft iron coiled with wire constituting a small bobbin of such dimensions that the length of the polar field of the magnets is practically infinite with regard to the bobbin be moved so as to cut the lines of force in the magnetic field, currents of electricity will be generated in the wire, the direction of which currents will depend on the direction of the movement of the bobbin. These currents, however, are of little intensity. Now, in machines according to the new invention, a pole of the opposite name to the pole to which the bobbin as just referred to is already subjected is brought into contact with each end of the bobbin and moved with the bobbin, and in this way currents are generated of considerable intensity without change of polarity of the core of the bobbin, the core itself forming an extension of, and joining, two poles of like name. In carrying out the invention in magneto-electric and dynamo-electric machines, the inventor arranges a permanent or electro-magnet in such a manner that the armature or armatures may be made to be of opposite polarity to those magnets which surround it or them, and before whose poles it or they, is, or are, made to revolve. Referring to the accompanying drawings, in which like letters of reference indicate similar parts, and which are appended by way of illustration, fig. 1 is a diagramatic view explanatory of the general principle of the invention; n, s, n, s, are a number of bar magnets laid side by side, and serving to create a magnetic field which the coil (in this case shown above the south field) never leaves. This coil is wound upon an iron bobbin in contact with the two north poles of two other bar magnets. When the coil with its accompanying two magnets is moved so as to cut the lines of force, a current is generated in the convolutions which may be demonstrated by a galvanometer included in the circuit as shown. Fig. 2 shows a side elevation partly in section, and fig. 3 a cross section of one form of apparatus according to the invention, n, s, is a horseshoe magnet firmly fixed by standards, h, h, to the base, z. e is an iron plate forming a polar extension of one pole. a is an armature, the shape of which, when denuded of wire, is seen at fig. 4. Fig. 5 shows the method of coiling which may be adopted. The armature by induction forms a polar extension of the pole, s, thereby causing the core of the armature to be of s polarity, and of opposite name to the plate or polar extension, n, or *vice versa.*

FIG. I

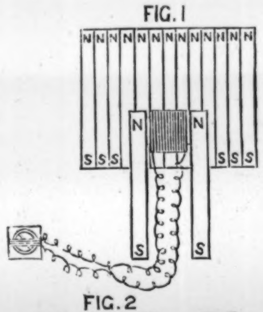
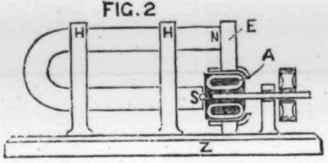


FIG. 2



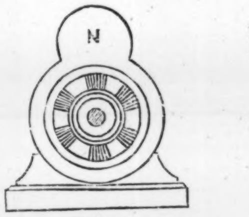


FIG. 3

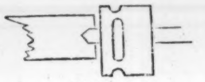


FIG. 4

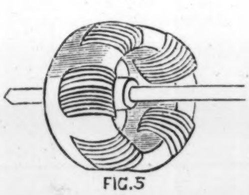
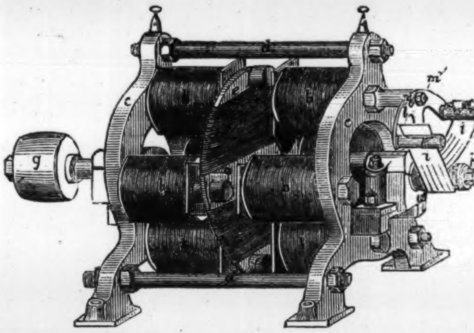


FIG. 5

1867. "Electric arc lamps." A. B. Brown. Dated April 19. 6d. Has for its object, by a combination of simple automatic contrivances to obtain on the one hand a feed or progressive movement of the carbon or carbons of an electric arc lamp very closely according with the actual gradual consumption of the carbons, and on the other hand to secure the speedy readjustment of the carbons to the desired arc distance apart whenever they, from any cause, become so far separated that the current cannot pass. In carrying out the invention, the feed movement of the carbon or carbons is effected by the weight or pressure of a piston and parts attached thereto, the piston working in a cylinder and pressing on a liquid which has egress only through a small port, formed in a port face having on it a small slide valve, the position of which regulates the egress of the liquid and consequent movement of the carbon or carbons. The valve is connected to the iron core of a solenoid and to an adjustable spring, the current passing through the solenoid coils being that which forms the luminous arc, and tending to move the core so as to close the valve in proportion as the current passing is stronger, whilst the spring is arranged to act oppositely and to tend to open the valve whenever the current becomes weaker. The piston or a part moving therewith, carries the carbon in a tubular or other suitable holder, in which holder the carbon is capable of moving the current, being led to it through a flexible coil or spiral. The carbon is ordinarily held in its holder by a lever acting on it with an eccentric or other suitable gripping device which only acts when the lever is being raised or held up. When the current is passing all right, the gripping lever is held up either by the core of the solenoid which regulates the progressive or feed movement, or by a separate solenoid or electro-magnet; but when the carbons become so far separated that the current cannot pass, the gripping lever becomes released, and allows the upper carbon to descend into contact with the lower one. The current then passes again, and the solenoid or electro-magnet raises the gripping lever again, and the gripping lever in rising, lifts the upper carbon the proper distance for the predetermined length of arc. The gripping lever is proportioned and arranged to give the proper amount of lift for the required arc, and its descent may be regulated by an adjustable stop.

1875. "Secondary batteries." D. G. FITZGERALD, C. H. W. BIGGS, and W. W. BEAUMONT. Dated April 19. 6d. According to the present invention, the inventors deposit lead electrolytically either within moulds or dies in which the material is to be compressed, or in other moulds of similar form, or they deposit in bulk so as to obtain a mass of finely divided crystalline lead, such mass constituting the material from which porous plates or cakes flat or otherwise may be obtained by compression.

1878. "Dynamo-electric machines." J. H. JOHNSON. (A communication from abroad by J. M. A. Gérard-Lescuyer, of Paris.) Dated April 19. 6d. This invention relates to improvements in dynamo-electric machines, and it consists in a novel and special arrangement of the parts. The invention is based on a peculiar mode of coiling the wire upon the revolving armature or induced part of the machine, together with a special construction and arrangement of this induced part, for the purpose of still further augmenting the electromagnetic action, which is considerably increased by the said peculiar mode of winding the wire upon the armature; and another distinguishing feature of the invention consists in the novel arrangement of the commutator. A general view of the machine is shown by the figure.



CITY NOTES, REPORTS, MEETINGS, &c.

MEDITERRANEAN EXTENSION TELEGRAPH COMPANY (LIMITED).

ON Friday, the 1st inst., an extraordinary general meeting of the shareholders of the above-named company was held at Cannon Street Hotel, Sir James Carmichael presiding, for the purpose of considering a proposition by the Eastern Telegraph Company to purchase all the property, concessions, and undertakings of the Mediterranean Extension Telegraph Company.

In the offer, signed by the solicitor to the Eastern Company, Mr. Charles Burt, the following words occurred:—"The division of the amounts between the preferred and ordinary shareholders of your company appears to me to be a matter for your board; but taking the present market value of the shares as a basis, I propose that the amount shall be divided as follows:—

3,200 preference shares at £6 10s.	£20,800
12,000 ordinary shares at £1 12s.	19,200
	£40,000

The reserve fund would, I presume, be distributed amongst the shareholders in like proportions."

The Secretary, Mr. E. Tombs, having read the notice convening the meeting,

The Chairman said: Gentlemen, it will be in the recollection of all who were present at the last meeting of the shareholders, on the 31st August, that I then informed you that certain negotiations were opened with the Eastern Telegraph Company for the purchase of our property. I told you that these negociations were not in a state to bring before you, but that as soon as any definite proposal was made we should, before taking any further steps in the matter, or moving in any way in reference to the subject to compromise your interest, lay before you the whole question and take your opinion upon it before acting further in the matter; and it is with this object in view that a circular has been addressed to you enclosing the absolute offer of Mr. Burt, the solicitor to the Eastern Telegraph Company, and that you might yourselves form some opinion of that offer—and might meet with us and consult upon it. It would have been more pleasant to us as directors if that offer had been couched in a more liberal spirit (hear, hear). But such as it is, it is our duty to lay it before you, and to take your advice and have your opinion upon it. With regard to this meeting, of course we could not at a meeting to-day decide anything more positive more than to get the general wish of the majority of the shareholders. If you are to decide upon selling your property, then, of course, it will be necessary to call a special meeting, I believe. Our solicitor will tell me if I am wrong. Then we could go into a friendly liquidation and appoint liquidators, and then the liquidators would sell to the Eastern Telegraph Company. I believe that is the legal form of carrying out the sale. Therefore I asked you to come here to-day, and I am now most willing and shall be most anxious to answer any questions you may put as far as I can. We want to consult with you upon the best course to take (hear, hear).

Mr. W. Ford would simply like to say that he did not object to the terms proposed by the Eastern Telegraph Company, but he did strongly object as an ordinary shareholder to the proposed appropriation of the reserve fund in the manner set forth in Mr. Burt's letter. It did not come within the duty of the Eastern Company, and indeed it was beyond their duty and their province to make any suggestion as to the distribution of the reserve fund (hear, hear). That was entirely a question between the shareholders themselves.

The Chairman: Quite so.

Mr. Ford proceeded to say that in giving his assent to the terms proposed, and he trusted this meeting in giving their assent to the proposal for the purchase at the proposed price would not give their assent to the proposed appropriation of the reserve fund. That fund had been created at the expense of the ordinary shareholders, because it had been dividend kept back from them to which they would have been entitled if it had not been kept back as reserve.

The Chairman: It is certain that the distribution of the reserve *is* entirely a shareholders' question: you can dismiss that from your mind.

Mr. Ford said that he was glad, then, that he had ventilated the question. The meeting had been called to consider the offer proposed in Mr. Burt's letter, and that was one of the suggestions in that letter.

The Chairman: That is only a suggestion, I think, with the letter.

Captain Turner said that he should put it much more strongly. It was not a suggestion: it was an impertinence.

Mr. Burton: Will you explain to us what these preference shares are, and how they became such?

The Chairman said that the preference shares were created many years ago with the object of laying down new cables. He should say fifteen years ago. They were preference only as regarded ordinary dividends.

Captain Turner said he observed that the directors made no recommendation in this matter.

The Chairman said that the directors had made no recommendation. They wished the shareholders to consider this question themselves. He should like himself to abstain from giving any opinion as chairman of the board. The board would rather be excused from giving advice which the shareholders might afterwards think to be not advantageous. Of course he had his own opinion, but as this was a shareholders' question they ought to form their own opinion.

Captain Turner said he should very much like that the board would give an opinion, as perhaps they knew more about this matter than he did.

The Chairman: I can assure you the board do not, but as an original shareholder in this company—I paid my £10 per share—I have no hesitation in saying I do not want to part with my property at the price of the offer, but of course that is my own opinion. Other gentlemen who may have come in on much more favourable terms—who have only paid £2 or £3 a share—may think it desirable to do it. There are also the preference shareholders. We wish to carry out your wishes, but we would have you decide. We thought it right to point out the worst that could happen to you; that the Government guarantee ceases on the 4th December (the present month), and then if we go on we must rely entirely upon our own resources for our dividends. At the present moment we should not be able to pay our ordinary shareholders anything; but we could pay the preference shareholders something. There are, perhaps, prospects of getting more traffic, for the Mediterranean is a big lake, and the Eastern Company may not always hold the monopoly of that lake. Other companies may start. We have a good position in Malta; but we must not deceive ourselves. We shall have to rely upon our own resources. I do not see that we can work it more economically than we have done. We have been under Government supervision; we have had a Government officer on our board; we have worked with the greatest economy, and I do not think we can cut down much more.

In answer to a question,

The Chairman said the company had yet two Italian concessions; one good yet for seven years, and the other for nine years.

Mr. Thomas Adams said: Having heard the chairman's opinion upon the matter as a shareholder—and he thought that he (the chairman) ought to know pretty well what the resources of this company were—that the shareholders should not part with the property on the very low terms—scarcely anything for the ordinary shareholders. The offer of £1 12s. was not 32/- in reality; it was not all cash, but cash and 4 per cent. debentures; £1 12s. was 20 per cent. off that. Would it not be better to consider if something better could not be done, rather than part with the property in that way? He thought the board had an offer some time ago.

The Chairman: This is the first *definite* offer we have had.

Mr. Adams said he thought the board had an offer of some kind two years ago. Debenture stock was not of much value. If it had been cash, it might have been worth 20 per cent. more. He thought the offer not worth much; it was a mere speculative value. Some other company might be got up next week and give them better value for their property. This debenture stock was not like debenture stock in land; if they had a war, and could not get at their "rope," what would be the worth of their debenture stock then? Perhaps they would give them some idea as to how far the proprietors had yet given their opinion upon it. He did not want to say very much on the proposal, either one way or the other. It seemed to be a very miserable offer. He thought the preference holders would at all events get more than £6 10s. per share in the long run.

The Chairman: £6 10s. is the selling price.

Mr. Adams asked if it would not earn more than that for the preference shareholders to begin with.

Chairman: Yes; I think it would.

The Secretary said that the earnings last year would have given the preference shareholders 5 per cent.

Mr. Adams said he had no doubt that the preference shareholders would prefer that to the £6 10s. at 4 per cent.

A Shareholder asked how many proxies the directors held?

The Chairman said they had not got in so many as they ought to have. In proxies there was not a quarter of the capital of the company represented. But of those received, the greatest number were in favour of the proposal. There were 83 in favour, 18 against, and 21 shareholders had sent their proxies to the directors requesting them to vote as they thought best. That was an unfair responsibility to put upon them. They did not wish to bear that responsibility; they simply asked every one to vote for themselves. In reply to a further inquiry, the Chairman said that 693 shares were represented by the proxies of preference shareholders.

Mr. Vears said that the circular issued looked as though it carried with it the sanction, or implied sanction, of the chairman and the directors ("No, no," from the board). No document could be strictly neutral, and when it came from headquarters it tended to form a decision. He was utterly surprised at the paucity of expression of opinion at that meeting. They ought to have some remarks from the board indicating their opinion. For his part he was neither for accepting nor rejecting the offer. He would go home splendidly satisfied if forty out of fifty present were for it. He would ask the Eastern Company whether they were doing as they would be done by when they came with the market at its lowest and offered the lowest price? Surely they could put a little pluck and spirit into the matter. He believed the Eastern debentures were now something like 106.

The Chairman said there were no shares issued yet; it was a new issue.

Mr. Nicholls suggested that the meeting be adjourned, and that two ordinary and one preference shareholder be appointed to form a committee to confer with the directors.

Mr. J. L. Cuthbertson said that as an original and not a preference shareholder, nor a trafficker in the shares of this company from its commencement, he wished to ask, and he hoped the directors would not take offence at the question, whether they were directly or indirectly connected with the Eastern Company. (The Board: "No.") A question had been raised as to the preference shares. The preference shareholders had received a large dividend, and he thought the difference in the proposed sums, as set down, between the preference and the original shareholders seemed preposterous. He did not see himself why some sort of arrangement should not be made for this company to continue to go on. If the preference shareholders were to meet the original shareholders in a fair and equitable manner, the original shareholders might, with the reserve fund, and with economical management on the part of the board, go on as formerly. They might keep the company going and pay the preference shareholders something, so that eventually the company *might* assume an important position, or amalgamate with another company. He did not like to accept about £1 3s. or £1 4s. and about ⅝ per cent. for his money; he would rather lose the lot almost. He did not think they ought, as shareholders either original or preference, to accept the offer in its present form. If a shareholder had purchased his share at something like £2, it placed him in a very different position from the man who had paid £10 for his share. The original shareholders ought to be shown some little consideration. The company had not really earned anything to pay the preference shareholders one penny according to the last six months' earnings. Under these circumstances it would be well to have the sense of the shareholders as to whether it would be well to go on with the company. They looked upon the officers of the company to make some little sacrifice as they had to do themselves. The question of salaries, for instance, might be guided by results.

Captain Turner said he should like to make one more appeal to the chairman and the board to give the shareholders their opinion and advice. He thought it was their business to give the shareholders any facts of the case. He knew many cases in which that had been done.

Sir Ashley Ponsonby (a director) remarked that he thought it was a difficult matter to give an opinion upon the matter, owing to the different prices paid by various gentlemen for their shares. To those who were large holders and had paid large sums for their shares the board's individual recommendation might be taken for what it was worth. He certainly did object, as a shareholder, to selling at the price. Being on the board he would be happy to go as the shareholders went. He was opposed to the offer, which he thought was a minimum one. This company paid the Eastern Company a large sum of money—about £7,000 a year—for messages sent over their wires. Very probably there would be other lines opening up, by means of which this company might make a profit. They had yet a seven years' concession from the Italian Government; and he could not see why they should part with their company just at this moment. He had great respect for the gentlemen of the Eastern Company, they were very sharp men of business, and not likely to part with a great deal, and this company was like a pear to drop into their mouths. Some gentlemen had remarked that the board could possibly reduce their fees, but he must warn them that the salaries of the board were now as low as they well could be. Certainly the board would do what they could in the matter to help the shareholders; but he thought they must not expect the board could do much in that direction. With reference to the earnings by last year's working, the shareholders must remember that they had repaired a cable at a cost of £1,760. They put that charge into the current half-year so that they might make the Government pay it. In future any repairs would have to be paid for out of the reserve fund. He did not wish to give any opinion as to the rights of the preference shareholders over the ordinary shareholders. If the shareholders decided to sell, they would have to do so at whatever price the courts decided.

Mr. Robinson (a director) said he wished to speak as a shareholder. He had been a proprietor in their company for a good number of years, and he had always endeavoured to carry out the proposition and urge upon the directors the necessity of amalgamation with the Eastern Company. Since he had been on the board he had endeavoured to produce that effect. He had had communication, some fifteen or sixteen months ago, with Sir James Anderson, when he stated that he would give us £2 10s. per share in cash, and give for our preference stock a debenture stock, at 3 per cent. That was submitted some time ago, but I think the opinion was that not less than £3 per share should be taken for the ordinary shares. There was no gentleman present who was a holder of preference shares, to give them any idea of the value of what he held. Since that time negotiations had been going on, and now the Eastern Company offered £1 12s. per share for that which only about sixteen months ago they offered £2 10s. For his own part he conld not see how to account for the apparent depreciation in the value of this company's property. If some company could be obtained to take up their cable to Alexandria, now lying dormant, this company would so tap the Eastern Company and probably pay a good dividend upon their property, and also a handsome dividend for whoever might lay the cable, and we know that there are contractors to be found in the present day who will take the cost of laying the cable in shares of the company. I believe we have paid to the Eastern Telegraph Company, as intermediates, £165,000. We are offered 4 per cent. debenture stock for our property. Now, as Mr. Adams observes, 4 per cent. debenture stock of the Eastern Company would not be worth at the outside more than from £85 to £95, therefore it reduces the actual proposal which they make considerably below £1 12s. They suggest an appropriation of part of your reserve fund to make up any deficiency in their offer; but that does not constitute any portion of the value of your property in question. Another great feature is this. According to my view of the case, the interest which they would pay, presuming you accept their offer, of something like £40,000, at 4 per cent. would be £1,600 a year. Now they would save almost the whole of that amount; it would come back to them in saving working expenses, &c., because their company could do your work at very little additional cost, so that actually they would get the whole of your property for something like £400 a year. That appears to me as a shareholder sadly too low, and I say again I cannot see any reason for the discrepancy between £2 10s. which they offered sixteen months ago and £1 12s. which they offer now. They have taken the least minimum market price of the day; indeed, I believe that something like £1 17s. 6d. may be obtained for your shares to-day, and yet they only offer £1 12s. Now when you deduct the expenses and one thing and another, it shows the very small price they are offering for your property. However, as the chairman and Mr. Ponsonby have justly said (and it is my own opinion as well) it is a shareholders' question entirely, and the directors do not wish to bias in any way the opinion which you as shareholders choose to adopt, but they will carry out, as I said at the commencement, faithfully and truly whatever you choose to suggest as most advisable for your interest.

Mr. Beck inquired if any officers of the company would be taken over.

The Chairman said he believed some of the staff could be taken over; and, of course, it would be the duty of the company to recompense those who were not. They have been many years in the service of the company—some of them. They would have to be paid out of the reserve fund.

Mr. Beck said he was glad that the chairman agreed with him that they would have to be recompensed.

A Shareholder asked what steps had been taken towards getting a renewal of the guarantee from the Government.

The Chairman here read a letter by himself to the Treasury, dated 24th August, asking if there were any likelihood of a renewal of the guarantee, but to that he received a negative reply. The letters were as follows:—

Mediterranean Extension Telegraph Co., Limited,
Gresham House, Old Broad Street, E.C.,
London, August 25th, 1882.

Sir,—I have the honour to submit the following proposition, on behalf of the Mediterranean Extension Telegraph Company, which I trust may meet with the favourable consideration of the Lords Commissioners of the Treasury.

This Company was originally constituted under the sanction of the Governments of Great Britain and Sardinia, in 1857, with the object of connecting the Islands of Sardinia, Malta, and Corfu by submarine cables, and a guarantee of 6 per cent. per annum was granted by Her Majesty's Government on £120,000, the original capital of the company, for a period of 25 years.

The cable between Cagliari (Sardinia) and Malta was subsequently destroyed by volcanic eruption at the bottom of the sea, and the line between Malta and Corfu being also interrupted, a fresh arrangement was made with Her Majesty's Government by which the guarrantee was confirmed, the company laying down two new cables, one between Malta and Sicily and the other between Corfu and Otranto, to replace the original cables which had been lost. The traffic on both these lines, and especially on that between Malta and Sicily, proved very satisfactory, and during several years only a small amount of the guarantee was required from Her Majesty's Government, and between the years 1863 and 1866 no call whatever was made upon the Treasury in that respect.

In 1869, the Anglo-Mediterranean Telegraph Company (now the Eastern Telegraph Company) duplicated their line between Malta and Alexandria, and called upon the Mediterranean Extension Company to lay a second cable between Malta and Sicily, as they maintained that one line would prove insufficient for the traffic between Alexandria and the European continent. The Mediterranean Extension Company accordingly raised additional capital and complied with the request, but shortly after the establishment of this second line between Malta and Sicily, the Anglo-Mediterranean Company extended their line from Malta to Gibraltar, and thence to Lisbon and Falmouth, and thus diverted to their new route all the messages between England and the East which had hitherto passed over the wires of the Mediterranean Extension Company.

A concession was subsequently granted by the French Government to Baron Erlanger for the establishment of telegraph lines between Marseilles and Bona (Algiers), and from Bona to Malta, and Her Majesty's Government, notwithstanding the earnest protest of the Mediterranean Extension Company, gave permission to Baron Erlanger to land and work his cable at Malta, which naturally proved most prejudicial to the interests of both the company and Her Majesty's Government, as these new lines (which were afterwards sold to the Eastern Company) abstracted all the traffic between Egypt and France which had previously been transmitted by the Mediterranean Extension Company's cable *viâ* Sicily and Italy.

I would, however, beg to draw my Lords' attention to the fact that notwithstanding these heavy blows and severe losses of traffic sustained by the company, they continued to manage their business with so much economy, and with such partial success, that up to the present moment the average payments made by the Treasury have only amounted to £3,231 per annum, while under the guarantee Her Majesty's Government were liable to the payment of £7,200 per annum, or more than double the amount actually received by the company.

The period of terminating the agreement between Her Majesty's Government and the company is now approaching, and it will legally become void on 2nd December of the present year.

I am therefore induced to lay this short statement before my Lords, and to solicit the renewal of the guarantee of Her Majesty's Government in such modified form as they may consider advisable.

I am aware that a telegraphic communication with Corfu is no longer of any importance for Government purposes, but I venture to submit that it would be clearly to the advantage of Her Majesty's Government to grant a small subsidy rather than abandon an existing telegraph line with Malta by which messages could be sent to and from Great Britain either through Italy and *France*, or through Italy and *Germany*.

Should the cables between Malta and Gibraltar, or between Gibraltar, Lisbon, and Falmouth become at any time interrupted, this alternative line of communication might prove invaluable to British interests, and to Her Majesty's naval and military departments, especially in the event of certain political complications in the Mediterranean, which might possibly develop from the present critical state of affairs in Egypt.

The Mediterranean Extension Company could not, however, hope to continue the working of this line between Malta and Sicily in face of the severe competition already mentioned, without some encouragement and support from Her Majesty's Government, and I therefore trust my Lords may be induced to grant renewal of a portion of the present guarantee, on condition of the line being maintained in good working order.

I am, Sir, your obedient servant,
(Signed) J. R. CARMICHAEL, Chairman.

P.S.—A copy of this application has been forwarded to Her Majesty's Secretary of State for War and to the Lords Commissioners of the Admiralty, for their information.

TREASURY CHAMBERS,
October 17th, 1882.

SIR,—I have laid before the Lords Commissioners of Her Majesty's Treasury your letter of the 25th August last, requesting that the guarantee of Her Majesty's Government might be continued to the Mediterranean Extension Telegraph Company, Limited, after the expiration of the present agreement on the 2nd December next.

I am directed, in reply, to inform you that my Lords regret that they can hold out no hope of a prolongation of the present agreement after its expiration on the 2nd December next, or of the renewal of the guarantee of Her Majesty's Government in a modified form.

I have the honour to be, Sir, your obedient servant,
LEONARD COURTNEY.

The Chairman,
Mediterranean Extension Telegraph Company,
Gresham House,
Old Broad Street, E.C.

Capt. Turner then moved and Mr. Beck seconded "That the offer of the Eastern Company be rejected."

The proposition was put to the meeting and carried amidst cries of "All, all."

A vote of thanks to the chairman, proposed by Mr. Price and seconded by Mr. Wheeler, concluded the proceedings.

THE FAURE ELECTRIC ACCUMULATOR COMPANY (LIMITED).

AN extraordinary general meeting of the Faure Electric Accumulator Company (Limited) was held at the Cannon Street Hotel, on Monday, under the presidency of Sir A. J. Otway, M.P., when the subjoined resolution, which was passed at the extraordinary general meeting of the company held on Monday, the 6th of November, was submitted for confirmation as a special resolution:—"That the scale of voting by the shareholders, as at present prescribed by clause 64 in the Articles of Association of the Faure Company be altered, and that a clause be substituted in lieu thereof in the following terms:—'That, on every question to be decided by a poll, every member present, in person or by proxy, shall have one vote for every ordinary share up to ten inclusive, and he shall have an additional vote for every five shares beyond the first ten ordinary shares up to 100 inclusive, and an additional vote for every ten ordinary shares beyond the first 100 shares. And the holder of every ten deferred shares shall have the same number of votes in respect thereof as if they were one ordinary share, every ten deferred shares being, for the purposes of voting, always equivalent to one ordinary share. No member shall have more than 500 votes in all, and no member shall be entitled to vote on a poll as the holder of any shares in respect of which he shall not have been registered for three calendar months previous to the meeting.' "

Mr. Herbert Canning, secretary, having read the notice convening the meeting,

The Chairman said: Gentlemen, you have heard the notice read convening this meeting, and therefore are aware of the object for which we are called together to-day. It is formally for the confirmation of the resolution which was passed, I think, with unanimity on the last occasion on which we met. But subsequently a later circular was issued, which intimated that possibly some important statements affecting the conduct of the company would be put before the meeting. That seems to me to be really the point that most interests us to-day. The confirmation of the resolution will be merely a formal matter, and I daresay those who approved it on the last occasion will not be now inclined to alter their opinion. With regard to the important statements announced, I ask your serious attention. I think I said in another room in your presence that I always considered a straightforward, outspoken course should always be taken between directors and shareholders. I do not understand any other way. Therefore I shall not depart from it. Therefore, when directors have decided upon any course of direction to be taken which may affect the interests of the company, it is our duty to make it known to you. Therefore, gentlemen, I make no apology for the announcement that statements which might be of importance would be given to you to-day. I will endeavour to make them very clear and intelligible to you. The general meeting the other day with unanimity approved of the project of M. Philippart with regard to the proceedings of this company; and I may be allowed to say, in passing, that I recognise in M. Philippart a man of very remarkable ability and very special knowledge with regard to the accumulator. I have said that more than once. My impression is that in any matter he undertakes he will try to succeed. I have every reason to hope that it will succeed. I hope he will succeed, for the sake of the company. I believe if it does succeed it will be of very great pecuniary advantage to this company. That I think also is the unanimous opinion of my colleagues on the board. There is one important thing in conducting the business, which, if it was more important than another, was that if the manufacturing the accumulators was to be done in England, and if the business of this company was to be done in England, and if the business of this company is to be carried on in England, I felt it was essential that the directors of the company should be English; on the other hand, if the making of the accumulator is not to be carried on in England, and if the business is to be transferred to another company, I am not sure that English directors are best or in the right place. When the affairs of the business of the company are in the hands of another company, I should not be the proper person to conduct the business any longer, if that is to be the order of the future. I find I am quite in concord with the members of the board. It would not be necessary for us, and we doubt if we should be the proper persons in these circumstances, to conduct the business of the company. After we separated we submitted the plans that were submitted to us for the conduct of the business of the company in the future, and I think we considered them with every desire to give effect to the unanimous opinion, as expressed by the general meeting on the occasion to which I refer. We did not find ourselves able to concur in the mode, when it was proposed to carry into effect that resolution. I do not wish to say one word against it, not one word. I think M. Philippart perfectly well knows what he is doing and how to conduct business according to his custom, especially in France. The mode of procedure did not commend itself altogether to us. I have not been, and I am not aware that any of the directors have been, connected with the financial operations of this company. We have considered this company more as an industrial than a financial one. Moreover, the method of procedure did not seem to correspond to our notions as to the way the business of this company should be conducted. We came to the conclusion that the necessity of the position was, when the new mode of procedure came to be carried into effect, we should not be the persons to give effect to it. We think that either the directorate should be more limited, or gentlemen more in accord with M. Philippart's views should be associated with him. In accordance with this, we should have to ask you to elect some gentlemen to fill our places at once, but we remembered that we have an obligation to the shareholders in connection with the Société la Force et la Lumière, who undertook to give one fully paid-up share for two £2 paid shares to any shareholder who might hold shares at this moment, in regard to his shares so transferred. I think, as that obligation was undertaken while we were still administering the affairs of the company, that it is right and proper, and seems to me to be our duty, to remain on the board to see that obligation fulfilled (hear, hear). The fulfilment of that obligation does not take place until January 1st. Unless M. Philippart previously determines it or comes to some decision, we shall consider it our duty to remain in the position that we are in until the 1st January. There is no necessity after that that we should continue to sit here. I am perfectly certain that it would be for the advantage of the scheme that M. Philippart should have gentlemen associated with him who are entirely in accord with his views. I repeat yet once more that I do not wish to say one word against M. Philippart's scheme, or his mode of carrying that scheme into execution. He is a man of such capacity that I think he will succeed. He will tell you presently how the matter stands. If he succeeds it will be a pecuniary advantage to this company, I believe. I have only to repeat that the scheme is not on the lines on which this company was formed, and on the lines upon which we assumed the direction. I hope you will consider it consistent with our obligation if, on the 1st of January, we ask you to relieve us of any further responsibility in this matter. I will put the resolution first, after which I shall be glad to hear any remarks any gentleman may have to make. I think it will be interesting for you to hear any remarks M. Philippart may have to address to you.

The Chairman then moved the resolution printed above, which was seconded by Mr. Leon, and carried unanimously.

M. Philippart then addressed the meeting in French, Mr. Campbell, the solicitor to the company, acting as interpreter. M. Philippart said: Since their last meeting he had been making arrangements in order to carry out the programme he had laid before them. He thought it was almost settled now, except the affixing of the necessary signatures. The first thing he gave his attention to was with the Storage Company, who gave back to the Faure Company 20,000 shares which they held in the Faure Company, upon certain terms and conditions. The shares which the Storage Company possessed in the Faure were a burden to the former company, and would be a considerable danger to it if it ever came to a liquidation of the company. If ever this company came into liquidation from one cause or other, they would, out of the funds of this company, get a considerable proportion with respect to shares they held, for which they paid nothing. M. Philippart meant to say that he had not given an opinion that the Faure Company would have to go into liquidation, but he considered its mode of procedure such, that if it continued to go on without some change being made in the manner of conducting the business, there might *possibly* arise some question of liquidation, and his views were such as to endeavour to put it on a different basis; and he thought the arrangement to be ultimately carried out would be this:—The Faure Company should transfer to the Storage Company the remainder of the English patents, the Storage Company giving back to the Faure the shares which the Storage held in the Faure. If the Faure Company did go into liquidation with the funds that they had in their hands, the value of the shares they held in the Storage would more than replace the whole of their capital, and leave £50,000 to the good. He had the highest opinion of the Faure accumulator and the Sellon-Volckmar, which he considered the only accumulators of any good whatever. He should be very sorry to see this company liquidate, and only get £50,000. He looked for a much better future for the company. He had the greatest opinion on the question of electricity, and if any profit was to be made in England, a very much larger profit must of course be made on the continent. In speaking of the continent, however, and of the different countries of which it was composed, he considered France, and France alone, on the question of electricity, was worth all the other countries abroad. By arrangements he had made, which he had signed in his own personal name, he was the possessor of all these patents for France and the French colonies; and if these contracts became definite, and that depended upon the shareholders of the Faure Company, the Faure Company could then be proprietors of 92 per cent. of the patents in France, for France and the whole of the continent. He had great hopes of this business, and also great hopes for the shareholders; and let them remember that he and his friends were the proprietors of the largest proportion of this concern at present, and whatever his hopes were, theirs should be equally good. He hoped by the end of March that the shareholders would receive back a sum equal to the amount of the money they had put into the Faure Company, and they would possess beyond that a share of equal amount in the French company, the owner of all the French patents. Whether they paid £2 or £10 per share, they would get the whole of the money back which they paid into the Faure, and be left the possessors of an equal amount of value in the company possessing all the French patents. Having given them these few details, he would make a few remarks upon those of the chairman as to the future action of the directors of this company. He could quite enter into the feelings of the directors, who said for the future the thing would be more French than English, and it was probably right that the management of the concern should be in the hands of those gentlemen in France and not in England. But he did not see the necessity for all of them to retire: he could quite understand that the majority might be French gentlemen, but he did not see why some of the gentlemen of the present board should not remain. But that was a personal question which he could not decide for them.

A Shareholder asked whether the Faure Company would cease to exist in that case?

The Chairman: Oh, no.

The Solicitor: The Faure would not cease to exist unless M. Philippart chose to give them back the sum they had paid into the Faure, and they were handed the French shares. The Faure would then practically cease.

M. Philippart said if the shareholders received back all the money they had paid into the Faure Company, and all the profits they drew in the future were out of the French company, he did not see the necessity for taking up two boards of directors, one at home and one abroad.

The Chairman: That is exactly the view of the directors.

A Shareholder remarked that he thought he understood that all their interests in the hands of the present directors would die and be taken by the French directors.

Another Shareholder asked, supposing a man held fifty shares at £10 each, and another fifty at only £2, what would be the return to those two categories of shareholders?

M. Philippart: The man with the £2 shares would get £2 per share, and the £10 share, £10.

The Chairman said, as one or two questions had been addressed to him as to *when* M. Philippart would give one share for two shares, and that was the question the directors wanted to see carried out, he had asked M. Philippart, and the answer was before the 1st of January the shareholders would receive, such of them as exchanged, one fully paid-up share of the Faure Company for two £2 paid shares in the same company.

A Shareholder said: Suppose they had paid £4, would they get the £10 share on the 1st January?

The Solicitor said: If they were paid off they would get four sovereigns and a £10 French share, because they had taken up a £10 English share.

Another Shareholder said: And interest on it (laughter)?

Mr. Philippart: Yes.

A Shareholder: What rate (loud laughter)?

A Shareholder asked if he had two shares of £2 each and gave them up to the French company whether that £4 were cash paid or not it must be returned to him. Did he get that in cash or receive ten sovereigns and a £10 share in addition (loud laughter)?

The Solicitor explained that the statement made was simply an indication of M. Philippart's hopes and desires, and that a general meeting would be called to consider it when the time came. If four sovereigns had left their pockets they would have four sovereigns back into them again, and, in addition, a piece of paper representing £10 in the French company. Those who had accepted the exchange of shares, as offered by M. Philippart, need not trouble themselves about the call of £1 on the Faure shares.

A Shareholder: How about those who have not accepted the exchange?

The Chairman: You must pay your call.

A Shareholder inquired whether in the event of the shareholders not accepting this offer the company would be wound-up?

M. Philippart said that was a question for the shareholders.

The Chairman: He must take exception to one remark by M. Philippart. He could not allow that this company had need come to liquidation but for his scheme. So much in new companies had to be done in experimental phases, that they could not expect to have a large return immediately for such an invention. They were so far from winding-up that everything was going on exceedingly favourably. They were making that progress which was consistent with the working of that invention, which required a very great deal of experiment. There was nothing in the working of the company that would have brought them anywhere near liquidation. He hoped that the lines they were now about to start on would bring them great profit. He must repeat he had no concurrence with the scheme, and he thought he spoke the feelings of the board too. He did not say one word against M. Philippart, for he had always acknowledged his capacity. He believed M. Philippart lighted up the opera in Paris at the price paid for gas, and if he could do that, he (the Chairman) thought he would bring great profits to this company. At the same time he could not depart from the line of business which was right according to his mind, for one which did not commend itself to him. He wished the shareholders every success, and as he was a shareholder with them, he hoped M. Philippart's scheme would be successful. He thought M. Philippart had given a complete explanation of his scheme, and all he (the chairman) had to object to in it was that this company would be in no way led into liquidation had his plan never been started.

This being all the business before the meeting,

Mr. Leon proposed a vote of thanks to the chairman, thanking him for his open and frank conduct in dealing with the shareholders.

The Chairman, in reply, said that the board had endeavoured to do their duty conscientiously, and he only hoped the shareholders would meet with the success that had been promised them.

THE ORIENTAL TELEPHONE COMPANY.—A second extraordinary general meeting of this company was held on Monday last, Colonel Gouraud presiding, for the purpose of confirming the resolution passed at the extraordinary general meeting of November the 13th, 1882. The meeting was purely of a formal nature and lasted only a few minutes.

THE creditors of the Telephone Supply Company (Limited) are required to send in the particulars of their claim to the liquidator by the 15th inst., and of Henry Rees and Company (Limited) by the 12th of January next.

THE secretary of the West India and Panama Telegraph Company writes that the company has received advice of the repair on the 1st inst. of the cable between Jamaica and Ponce (Porto Rico), thus restoring direct telegraphic communication with all their stations except Grenada, Trinidad, Demerara, and the Isthmus of Panama.

TRAFFIC RECEIPTS.

The Cuba Submarine Telegraph Company (Limited). The number of messages passing over the lines of this company during the month of November was 2,005, estimated to produce £1,800, against 2,334 messages, producing £2,439, in the corresponding month of last year. The August receipts, estimated at £2,550, realised £2,595.

The Direct Spanish Telegraph Company (Limited). The traffic receipts for the month of November, 1882, are £1,998, as against £1,810 in the corresponding period of last year.

The Eastern Telegraph Company. The traffic receipts for the month of November, 1882, were £54.098, against £49,829, in the corresponding period of 1881

The Eastern Extension Telegraph Company. The traffic receipts for the month of November, 1882, were £32 591, against £32 557 in the corresponding period of 1881.

The Western and Brazilian Telegraph Company (Limited). The traffic receipts for the week ending 24th November, 1882, were £2,713, after deducting the "fifth" of the gross receipts payable to the London Platino-Brazilian Telegraph Company (Limited).

West India and Panama Telegraph Company (Limited). The estimated traffic receipts for the half-month ended the 30th November are £1,160, as compared with £2,254 in the corresponding period of 1881. The August receipts, estimated at £4,374, realised £4,362.

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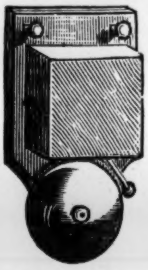

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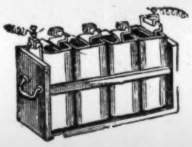

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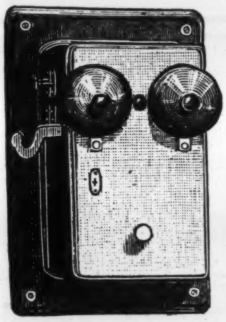

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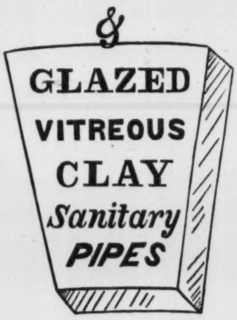
M  S

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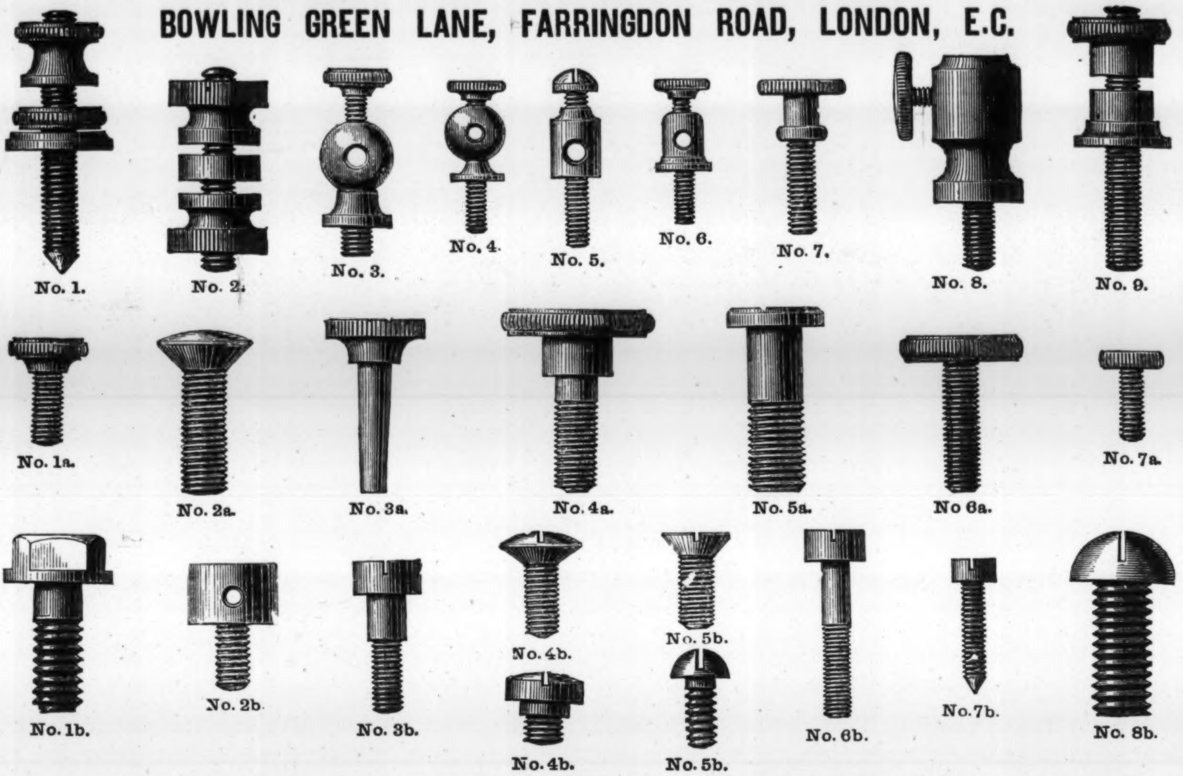
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